

# Between instrument and everyday sound

Concluding reflection for Norwegian Artistic Research Programme



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## Multidimensional terrains

Concepts from the revised project description *Between instrument and everyday sound*<sup>1</sup> and developments suggested 2013 in the assessment application<sup>2</sup> can serve as overall perspectives for my work as a composer within the Norwegian Artistic Research Programme, and the final artistic results.

### Summary

The project *Between instrument and everyday sound* set out to deal with multidimensional phenomena of sound explored within instrumental, vocal and electroacoustic mediums.

"The aim of the project is to explore multidimensional, amorphous and vague expressions arising when many aspects of the music are given more independent roles than in traditional musical writing styles. What interests me is to manoeuvre within a continuum of means, where the historical sounds of the instruments are there as just one extreme within a continuum. All these aspects can best be explored in a diverse constellation: an hour long work for ensemble, voices and electronics, placed in a location where musicians and loudspeakers can be freely distributed throughout the entire space."<sup>3</sup>

### Vagueness through the necessary accuracy

Calvino described a search for a perceived 'vagueness' defined through a precision of language.

"So this is what Leopardi asks of us, that we may savor the beauty of the vague and indefinite! What he requires is a highly exact and meticulous attention to the composition of each image, to the minute definition of details, to the choice of objects, to the lightning and the atmosphere, all in order to attain the desired degree of vagueness."<sup>4</sup>

His Leopardi quotations describe views on a landscape from a multitude of specific places:

"in a passageway seen from inside or outside (...) places where the light mingles (...) on hills seen from the shady side so that their crests are gilded (...) by a colored pane of glass on those objects on which rays passing through that glass are reflected".<sup>5</sup>

Parallels can be found in definitions of all simultaneous physical aspects of a musical performance, in search of vague and amorphous sound phenomena. Dissolving gestures into nuances 'lightning', 'atmosphere' and spatial perspectives can become conscious efforts, in search of pleasant sides of this perceived 'vagueness'.

"...Giacomo Leopardi maintained that the more vague and imprecise language is, the more poetic it becomes. I might mention in passing that as far as I know Italian is the only language in which the word *vago* (vague) also means "lovely, attractive." Starting out from the original meaning of "wandering," the word *vago* still carries an idea of movement and mutability, which in Italian is associated both with uncertainty and indefiniteness and with gracefulness and pleasure."<sup>6</sup>

Dense "micro polyphonies" from thousands of sounds of a city does not need to be decomposed in the same sense. A concrete outside world can be brought into the work, or virtual worlds can be created through multidimensional precision of language.

### Melodics or trajectories

Imagined worlds can be decomposed and built up again through a polyphony of parameters.

"The melodic principle can be transferred to all traditionally static linear parameters. 'Klangfarbenmelodie' is known from the second Viennese school and can be extended by timbre modulation melody, spatial melody and 'melody' for all other aspects possible to modify over time."<sup>7</sup>

My initial use of the term 'melody' meets some resistance from Pierre Schaeffer.

"For a timbre-melody to have any chance of being perceived, the pitch of the sounds must remain the same from one note to the other all the time (as Schoenberg tried to do in *Farben*)."<sup>8</sup>

<sup>1</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*.

<sup>2</sup> Necessary quotations will be given below.

<sup>3</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*, p. 1.

<sup>4</sup> {Calvino, 1993, *Six Memos for the next Millennium*, p. 59-60} This observation follows a detailed list of types of refraction, reflection and topography giving the best perception of indefiniteness.

<sup>5</sup> Calvino, 1993, *Six Memos for the next Millennium*, p. 59.

<sup>6</sup> Ibid. p. 57.

<sup>7</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*, p. 2.

<sup>8</sup> Michel Chion, 2010, *Guide to Sound Objects: Pierre Schaeffer and Musical Research*, p. 43.

"The T.O.M.<sup>9</sup> remains sceptical about the feasibility of composing timbre-melodies like these, especially associated with pitch and duration series, where the perception of these, which is already difficult, masks out any possibility of identifying the timbre-melody."<sup>10</sup>

It will not be a point to prove that all parameters are equal. Timbre did in the Schönberg example need special attention to come to the foreground. What is clear, however, is that effects of depth into a sounding phenomena can be achieved when many parameters are in flux. Schaeffer makes a distinction between 'variation' and 'permanence', there are variable or static parameters.<sup>11</sup> 'Perception' as such of every element need not be a goal, continuous variation on parallel parameters can create a very audible richness in the overall sound, approaching what Claus-Steffen Mahnkopf has called 'apperceptive overload',<sup>12</sup> which is a defining characteristic of polyphony.

Through Schaeffer's reservations against multidimensional melodies, I started thinking in terms of trajectories shaping surface aspects of the music, as well as transformations or compositional choices below the audible musical surface.

"Ideas of *multidimensional melody* has developed into various uses of trajectory shapes, from the detail level (pitch, tempo, dynamic shape of a musical phrase), to a meta level; overall transformation of my own ideas, historical quotations, or spectral information of sounds. A flow of information is altered by curves of chronology, sorting after criteria, or pitch scaling. One result has been hundreds of new fragments from a short Ravel quotation, and I continue to recycle my own ideas through chains of manipulations.

This can be considered approaches for *morphing* sounds into musical material, or transform musical materials. Tools and methods have been created through Ircams Open Music, through self analysis of my visual sketches for past works, and ideas of *morphing* music on a meta level. I have also used morphing in it's usual sense for treatment of sounds; a virtual orchestra can transform between string and flute timbre."<sup>13</sup>

## Morphing

Existing tools for cross synthesis can be used on recorded sounds, in search for hybrid identities of sound.

"Characteristics of something is transferred onto something else through *morphing*, known from digital sound or image-manipulation. Morphing is possible between sounds (with various types of vocoders, cross synthesis and cross fadings, through music technology, or as inspirational models for notated compositions)."<sup>14</sup>

## Meta morphing

"On a meta level, a sound can be 'morphed' into notation; if impulses from an everyday sound give rhythmical or harmonic progressions to an instrumental composition, or a quotation from the music history can be distorted in intonation and rhythm, to be reproduced as drops of water."<sup>15</sup>

Concepts of transformation or 'morphing' of musical materials posed technical challenges which led to software development occupying a significant amount of time.

## Intonation

"The equal tempered scale of the piano is a compromise where few intervals are 'pure'<sup>16</sup>. Analysis of a tone or a noise sound will reveal completely different intervals sounding more fresh, offering a higher degree of timbral homogeneity, liberating melodies from the tension of harmonic functions and other music historical associations attached to the intervals."<sup>17</sup>

"Finding alternatives to equal tempered 12-tone tuning has been an important part of this work. Through history a variety of tuning systems have been in use, offering fine nuances, pure and resonant, or with different types of dissonances or interferences offering completely different expressive qualities to the music.

Building a software organ has been important for intuitive experiments with tuning systems, and it can be a useful tool for rehearsing microtonal works in general.

Tunings are found from a variety of sources:

- Equal tempered divisions (including 1/4, 1/5, 1/6, 1/8, 1/10-tones).
- Western early music.
- Javanese Gamelan.

<sup>9</sup> Schaeffer, 1966, *Traité des objets musicaux*, essai interdisciplines.

<sup>10</sup> Michel Chion, 2010, *Guide to Sound Objects: Pierre Schaeffer and Musical Research*, p. 52.

<sup>11</sup> Ibid. p. 79.

<sup>12</sup> Dench, 2002, *Polyphony & Complexity*, p. 41.

<sup>13</sup> Ruben Sverre Gjertsen, from assessment application, 2013.

<sup>14</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*, p. 3.

<sup>15</sup> Ibid. p. 3.

<sup>16</sup> Based on simple number ratios from the overtone series.

<sup>17</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*, p. 3.



- African marimba tunings.
- Turkish Makam.
- Experimental composers (from Nicola Vicentino to Harry Partch).
- The harmonic overtone series.
- Pure Tuning by Eivind Groven.
- Spectral analysis of sounds (instruments, soundscapes or animals).
- My own just intonation tunings (based on overtone series).

This is not a field to cover exhaustively within this project, and it's not given I will use all of the tunings directly in my works. By comparing and selecting I can expand my repertoire of tunings to enrich sonorities of my music. Using electronics, a software organ, and scordatura strings, tunings can be used extremely precisely. For voices and ensembles practical approximations are necessary."<sup>18</sup>

## Terrains

'Landscapes' or 'terrains' can offer fruitful metaphors for a musical language, through sculpting fluid constellations of timbral phenomena, gestures and topographic perspectives, within a composed language, or working with everyday sounds in the most concrete sense.

"I have for some time seen 'terrain' as a useful musical metaphor, elements of a terrain will form continuously new constellations depending on position of the viewer. I have found ways of considering a musical score as a terrain, which can be scanned in a non linear way,<sup>19</sup> to form new orders, speeds, and ranges."<sup>20</sup>

## Exploring the space

The ear is able to recognize fine nuances of intonation, and our perception of spatial directions in a horizontal field is extremely fine-tuned.

"The musicians are stationary, while their performance can be spread flexibly through the room with live electronics, just like an electronic sound can relocate itself very rapidly through the loudspeaker setup. I wish to make the spatial aspect an important part of the project, and find locations enabling experiments with positioning of musicians and loudspeakers."<sup>21</sup>

## The vocal repertoire

"The human voice becomes an important part of the total instrumental palette, with all its possibilities and connections with everyday sounds. Luciano Berio<sup>22</sup> and Brian Ferneyhough<sup>23</sup> have explored vocal techniques with a wide expressive range between noise and singing, and I will continue from these. The singers can manoeuvre flexibly between timbral phonetics, overtone singing, and understandable text, which can again be superposed into a buzz of voices. Text collages from different literary epochs or different languages can superposed, and just as well be performed theatrically<sup>24</sup> (whispered, murmured, shouted) rather than be sung."<sup>25</sup>

I ended up using texts by A.R. Ammons, James Joyce and Demian Vitanza.

<sup>18</sup> Ruben Sverre Gjertsen, from assessment application, 2013.

<sup>19</sup> Time pointers and time scaling will be described in this text.

<sup>20</sup> Ruben Sverre Gjertsen, from assessment application, 2013.

<sup>21</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*, p. 3.

<sup>22</sup> In *Sequenza III* for soprano (1965).

<sup>23</sup> In *Time and Motion Study III* for 16 voices (1974).

<sup>24</sup> A coexistence of singing and theatre exists in the operas of Beat Furrer, and creates, in my opinion, a more spontaneous expression than recitativic operas by for instance Benjamin Britten.

<sup>25</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*, p. 5.

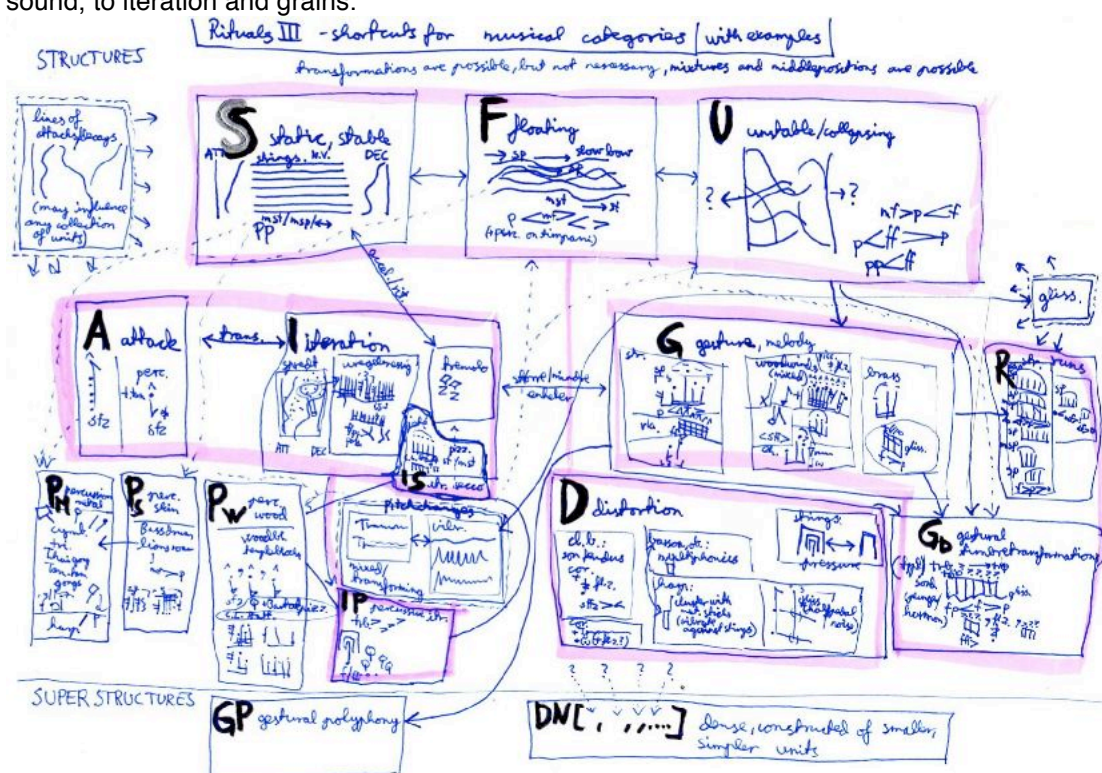
## Soundscape or sound object?

"During the 1960s and 1970s, two fundamental interdisciplinary tools for sound analysis were invented: the "sound object" (*l'objet sonore*) and the "soundscape." <sup>26</sup>

The two terms cover a contrast between composed or designed situations, and pure field recordings.

...although the sound object is an essential tool in education or sound design, it can hardly be used as a fundamental concept for the description and analysis of urban sounds.<sup>27</sup>

The term 'sound object' served as an inspiration for past works, suggesting isolated and sculptural ideas. Rather than extended situations of polyphony, I composed from a palette of objects, each object with its inner life and potential influences and transition towards other objects, while objects only exist within bubbles of various shapes and lengths. A composition unfolds by abruptly cutting and superposing elements of a palette. Like it is possible to sketch out an understanding of any everyday sound through a continuum of morphology, it is possible to find morphologies of an ensemble or orchestra. These are not neutral descriptions, but attempts to understand relations between clearly imagined orchestral sounds used in specific a work. It is also possible to look through Pierre Schaeffers tables describing a continuum from centered tone to noise, with a simultaneous flux from continuous sound, to iteration and grains.



Instead of finding extended 'polyphonies', all internal and diverse activities collapse into concise, vertical sculptures. A concise orchestral sound phenomena can contain worlds of internal microscopic life. Dense vertical weavings approach what Pierre Schaeffer called 'polymorphy', rather than 'polyphony'.

"Polyphony/Polymorphy therefore distinguishes:

- on the one hand, musics based on the coexistence of horizontal voices and distinct interrelated discourses (*polyphonic*);
- on the other hand, music based on vertical “blocks” and fused objects (*polymorphic*)

The history of music demonstrates the progressive transition of certain musics from a "polyphonic" to a "polymorphic" stage, as the voices are progressively fused into compact harmonic aggregates.<sup>128</sup>

Composing with 'polymorphic' objects can shift a focus away from a linear narrative of 'polyphony'. For me, this comes from an interest for ritual<sup>29</sup> and abrupt gestures, and

<sup>26</sup> [Multiple authors], 2005, *Sonic experience A Guide to Everyday sounds*, p. 5.

<sup>27</sup> Ibid. p. 6.

<sup>28</sup> Michel Chion, 2010, *Guide to Sound Objects: Pierre Schaeffer and Musical Research*, p. 83.

impressions of 'aperceptive overload'. Without throwing out all existing elements, this language can be expanded by more continuous situations and extended time scales.

Working with field recordings will be a fairly new element in my music. 'Found' and rich everyday situations can coexist with ideas composed through a thinking of morphology. The world is projected into the work, or virtual worlds are built from tiny 'sound objects'.

### Artistic research

Henk Borgdorff suggested a distinction between 3 types of 'practise-based research' in the arts.

"Frayling differentiated between 'research into art', 'research for art' and 'research through art'. I, too, will employ this trichotomy, albeit with a slightly different twist. I will distinguish between (a) research on the arts, (b) research for the arts and (c) research in the arts."<sup>30</sup>

"*Research for the arts* can be described as applied research in a narrow sense. In this type, art is not so much the object of investigation, but its objective. The research provides insights and instruments that may find their way into concrete practices in some way or other. Examples are material investigations of particular alloys used in casting metal sculptures, investigation of the application of live electronics in the interaction between dance and lighting design, or the study of the 'extended techniques' of an electronically modifiable cello. In every case these are studies *in the service of* art practice. The research delivers, as it were, the tools and the knowledge of materials that are needed during the creative process or in the artistic product. I have called this the 'instrumental perspective'."<sup>31</sup>

The description is suitable for parts of the project, there are technical challenges connected to live electronics, 'extended techniques', instrument building, research on intonation, development of compositional techniques to transform musical ideas both for scores and the massive amount of information necessary for a useful synthesis of sound. A path of research has works of art as goal, while it is necessary to keep visions of aesthetic results from the beginning; how can the methods become sculpting tools for the heard visions, and as well produce unexpected results?

"The question we must ask as musicians however is not, are these procedures scientifically valid, or even predictable, but rather, do they produce aesthetically useful results on at least some types of sound materials."<sup>32</sup>

If tools are still technically incorrect or in development, yet produce interesting results, the musical ideas are always more important than the correctness of the tools. The project suggest thresholds to overcome, until musical expressions involving multidimensional transformations, 'morphings', new (or old) intonation systems, live processing and spatial distribution of ensemble and electroacoustic sounds, can be brought into a synthesis.

I will in this text be making claims about effects of methods, which approaches turned out most useful, through experiments with musical ideas and technical challenges. The context for these claims is this concrete artistic project. It will not be a quest for the perfect methods, but expanding a repertoire of tools to meet specific musical challenges.

### Software tools

Two main tools were developed through the project and made available for free download and documented in separate texts.<sup>33</sup>

- *3 Manual Microtonal Organ* programmed with MaxMsp<sup>34</sup> and Fluidsynth<sup>35</sup>. This is a virtual pipe organ with possibilities to explore tuning systems and transformations between tuning systems. A database of tunings is written in a text format, and it's possible for users to add tunings to this database. This was used as an instrument in the final work of this project; *Landscape with figures II*.

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<sup>29</sup> I do not mean ritual in any religious sense.

<sup>30</sup> Henk Borgdorff, *Sensuous knowledge*, p. 5-6.

<sup>31</sup> Ibid. p. 6.

<sup>32</sup> Trevor Wishart, 1994, *Audible design*, p. 5.

<sup>33</sup> <http://www.bek.no/~ruben/research.html>

<sup>34</sup> <http://cycling74.com/>

<sup>35</sup> [http://imtr.ircam.fr/imtr/FluidSynth\\_for\\_Max/MSP](http://imtr.ircam.fr/imtr/FluidSynth_for_Max/MSP)

- *Ruben-OM* (an Open Music<sup>36</sup> patch library). Ideas of transformation and translation between sound and musical material was a technical challenge. I have chosen to make the most general tools public, including new rhythm quantification methods.

The separate software documentation will deal with general functionality of these tools, while this main text will refer to methods as means of realizing concrete musical ideas.

### **Artistic results**

The project was concluded through a performance of the work:

- *Landscape with figures II* [90'] performed 7/9-2013, Dansens Hus, Oslo, during the Ultima festival, by Song Circus, Oslo Sinfonietta and Notam, conducted by Christian Eggen.

The rest of this text will deal with realization of this work, and how areas of research were explored and possibly expanded through this work.

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<sup>36</sup> <http://repmus.ircam.fr/openmusic/home>



# Landscape with figures I

## Poem by Ammons

### "Landscape with figures

When I go back of my head  
down the cervical well, roots  
branch  
thinning, figuring  
into flesh  
and flesh  
glimmers with man-old fires  
and ghosts  
hollowing up into mind  
cry from ancient narrowing  
needle-like caves:

a depth of contact there you'd  
think would hold, the last  
nerve-hair  
feeding direct from  
meat's indivisible stuff:  
but what we ride on makes us ride  
and rootless mind  
in a thundering rove  
establishes, disposes:  
rocks and clouds  
take their places:

or if place shifts by a sudden breaking  
in of stars  
and mind whirls  
where to go  
then like a rabbit it  
freezes in grass, order  
as rock or star, to let whatever can, come,  
pass, pass over: somewhere another human  
figure moves or rests, concern  
for (or fear of) whom  
will start and keep us. <sup>37</sup>

## Composition of fragments

*Landscape with figures I* (2012) is a 16 channel endless sound installation, first shown 22th to 24th of october 2012 in Studio A, Rokkans Hus, Bergen (Artistic Research Forum). It became integrated in *Landscape with figures II*, as variable sound installation situations within a more fixed work.

Composing earlier works I have had parallel cycles of events in mind, which appear in new constellations in a kaleidoscopic manner. With initial outlines, detail work take over to fill bubbles of the kaleidoscope. *Landscape with figures I* was created as a large number of preprocessed sound fragments, as variations within a few main categories. The fragments should be complete statements alone, and work in any order or superposition with other categories of fragments. Durations vary between a few seconds and a couple of minutes. Constant new constellations of textures can create endless compositions.

Arne Nordheims installation Poly-Poly (1970) consisted of 6 independent tape loops. These would not meet at the same point for 102 years.<sup>38</sup> *Landscape with figures I*, with more than 1200 fragments, independently triggered in superposition and spatialized, would be a much

<sup>37</sup> A. R. Ammons Collected poems 1951-1971, p. 175.

<sup>38</sup> <http://lydskrift.no/story/memorabler-%E2%80%93-om-arne-nordheims-elektroniske-musikk>

longer composition, if the intention really was to exhaust all possibilities. This self-composing installation can work as a sketchbook for interactions between musical ideas over a long period of time.

## Types of fragments

The following chapters describe different categories of textures used in this installation. Most of them are created in at least 100 variations. Sets of rules are at work; some chords fragments can be repeated up to 5 times, some soundscapes prefer to be alone, and turn other sounds off, or adjust how often a particular type of fragment occurs. Rules can contradict each other and create unpredictable situations.

## Flutes and strings morphing

This category consists of chords with orchestral attack envelopes. Pitches and dynamics are based on tam-tam analyses. Several transformation steps change pitch contents, in this order:

- The first 750 milliseconds are chosen,<sup>39</sup> to give a focus on the attack phase of the sound.<sup>40</sup>
- Only partials longer than 50 milliseconds are kept,<sup>41</sup> to maintain the most stable components of the sound.
- The spectrum is used with original or inverted intervals (subharmonic spectrum).<sup>42</sup>
- Intervals are multiplied<sup>43</sup> with a number between .25 and 5.5.
- The whole sound is transposed somewhere between 3 octaves down and one octave up.
- 15-50 percent of the notes are selected randomly.<sup>44</sup>
- A bandpass filter<sup>45</sup> removes notes outside the practical range of the sampled sounds.
- Only notes softer than MIDI velocity 40 are kept.<sup>46</sup> This will remove some of the loudest partials and make the chord more balanced when performed by string and flute samples.
- A random chord note is transposed down and used as a virtual fundamental for overtone series spanning through the whole register,<sup>47</sup> used as a new pitch grid for the now strongly distorted tam-tam spectrum.<sup>48</sup> Floating number interval multiplications already applied can make the spectrum more harsh, artificial and less resonant. A harmonic series as intonation can bring back resonant qualities to the resulting sound.
- Notes of the spectrum are sorted by pitch, and sculpted by an orchestral attack envelope<sup>49</sup>.

### Synthesis of the versions

Settings were adjusted by trial and error to find more than 200 unique chords for the installation. The chords were exported as a Csound score for synthesis with samples. The samples were flutes (normal, breathy sound or flutter), and strings (sul ponticello, sul tasto, and high harmonics). To maintain as much as possible of the original sound characters, samples were automatically selected for a minimal transposition interval.

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<sup>39</sup> Ruben-OM; *select-multiseq-range*.

<sup>40</sup> Even though some of the analyzed sounds were more continuous scraping sounds.

<sup>41</sup> Ruben-OM; *select-longest-multiseq*.

<sup>42</sup> Ruben-OM; *invert-spectre-multiseq*.

<sup>43</sup> Ruben-OM; *interval-multiply-multiseq*.

<sup>44</sup> Ruben-OM; *random-selection-multiseq*.

<sup>45</sup> Ruben-OM; *bandpass-multiseq*.

<sup>46</sup> Ruben-OM; *select-softest-multiseq*.

<sup>47</sup> Ruben-OM; *spectralize-random-chordnote*.

<sup>48</sup> Ruben-OM; *approx2mode-multiseq*.

<sup>49</sup> Ruben-OM; *multiseq-env-poly*.

This is where the morphing happens: For each note, a string sample and a flute sample are transposed to the same pitch, a curve controls the morphing trajectory between two timbral sources, through morphing techniques available in Csound.<sup>50</sup>

### Spatialization

The notes individually go through a detailed spatialization. The Csound opcode *space*<sup>51</sup> distributes sound between 4 channels. Sounds at the simulated center of the room will be strongly amplified. To create a realistic virtual orchestra with balanced chords, notes are randomly distributed along the sides of the room, not too close to the virtual listener. The notes do not change positions, even though more surreal scenarios could have been attempted, as musicians flying around in the hall. Every note fades in various shapes between 2 different types of reverb, as if spaces were coexisting.

Reverbs were tested in advance<sup>52</sup> with sounds of strings, tam-tam and woodblock. The woodblock was especially revealing. I set early reflections short and discrete enough to create continuous reverbs, not as echos to disturb rhythmic patterns. It was possible to define dimensions of virtual spaces, from tiny bathroom, elevator shaft, halls of different sizes to huge valleys with endless resonance. Hanging 500 meters over a valley sound with no nearby walls, sounds just disappear into virtually endless resonances, while nearby walls leave impressions of confined spaces. Not just the sizes, but qualities and colours of the heard spaces can contribute to the compositions.

"...the reverberation effect, while perfectly described by acoustics, can also be applied to the domains of social communication or to rituals or mythologies."<sup>53</sup>

I gave up using sampled impulse responses for this project. The spatial richness of an orchestra surrounding an audience within variable spaces was simulated. Sound morphing could be the most surreal aspect about this projection, but it could be perceived as not too different from crossfading within a conventional orchestration. I did choose the morphing techniques giving the least strange results.

When projected through the 16 channel installation, these 4 channel spaces will be moving through what Trevor Wishart calls 'frame motion'<sup>54</sup>, including rotation, contraction and expansion. The distribution into a larger setup was done through 'distance based amplitude panning' (DBAP), an algorithm developed by Trond Lossius and implemented in Ircam Spat.<sup>55</sup>

Through experiments with sound diffusion over larger speaker setups, I found DBAP most suitable for the ideas of 'frame motion', as it does not rely on a centrally placed listener, nor does it strongly amplify the 'sweet spot' in the middle of speaker setup. It gave the most neutral shiftings of the 4 channel spaces. It is however not entirely realistic to move reverbs around.

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<sup>50</sup> The Csound opcodes *pvcross*, *pvsrmorph* and *pvsrmix* were chosen in this case.

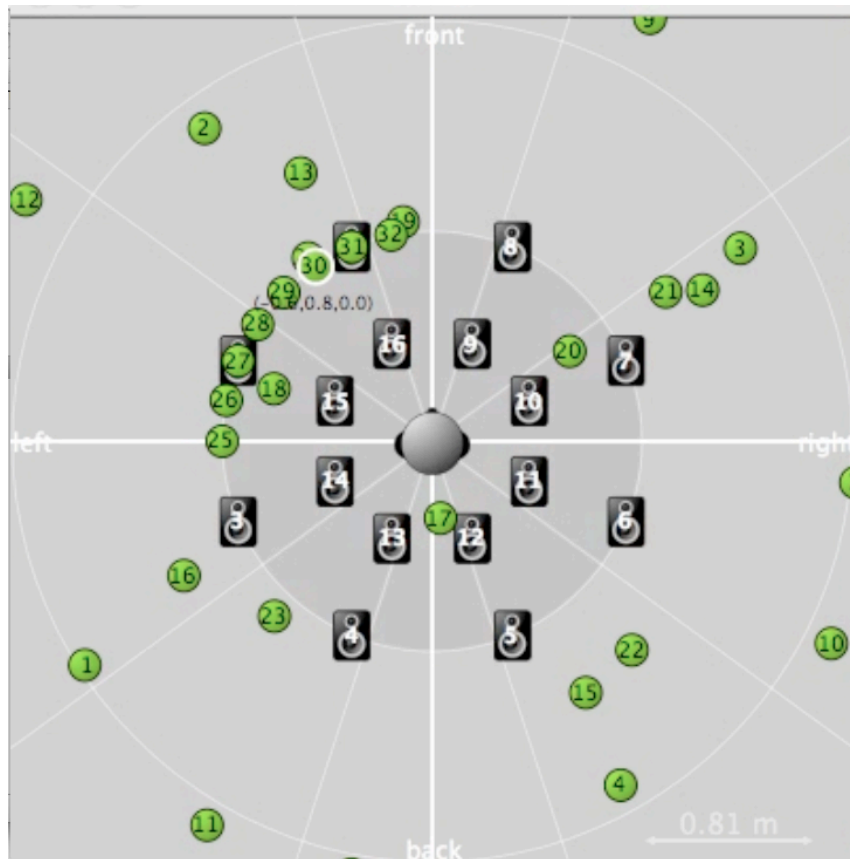
<sup>51</sup> <http://www.csounds.com/manual/html/space.html>

<sup>52</sup> I used code collected by Josep Comajuncosas as a starting point for my own adjustments:  
<http://www.csounds.com/jmc/>

<sup>53</sup> [Multiple\_authors], 2005, Sonic experience A Guide to Everyday sounds, p. 14

<sup>54</sup> Wishart, 1996, On Sonic Art, p. 228.

<sup>55</sup> <http://forumnet.ircam.fr/shop/en/forumnet/49-spat.html>

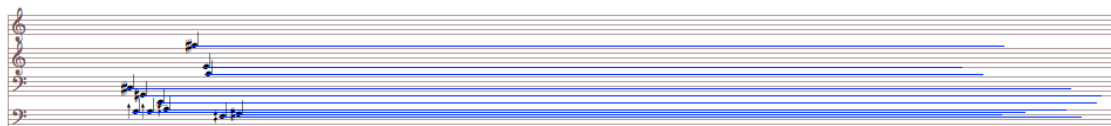


Visualization from Ircam Spat. The web version of this text contains movie demonstrating movement patterns.

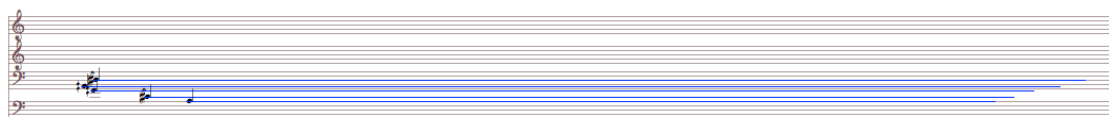
### Some examples

There is no published or edited score for the sound installation. Most of the situations exist within Open Music patches, and I will bring out a few notations with 1/8-tone approximation.

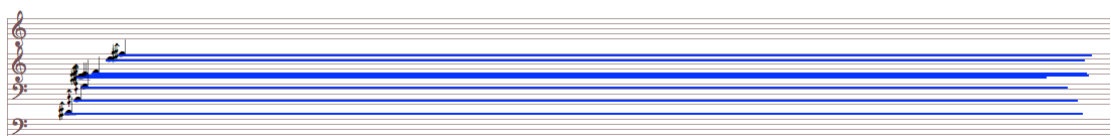
#### CD Track 1: Flute-morph-strings 14:



#### CD Track 2: Flute-morph-strings 18:



#### CD Track 3: Flute-morph-strings 70:



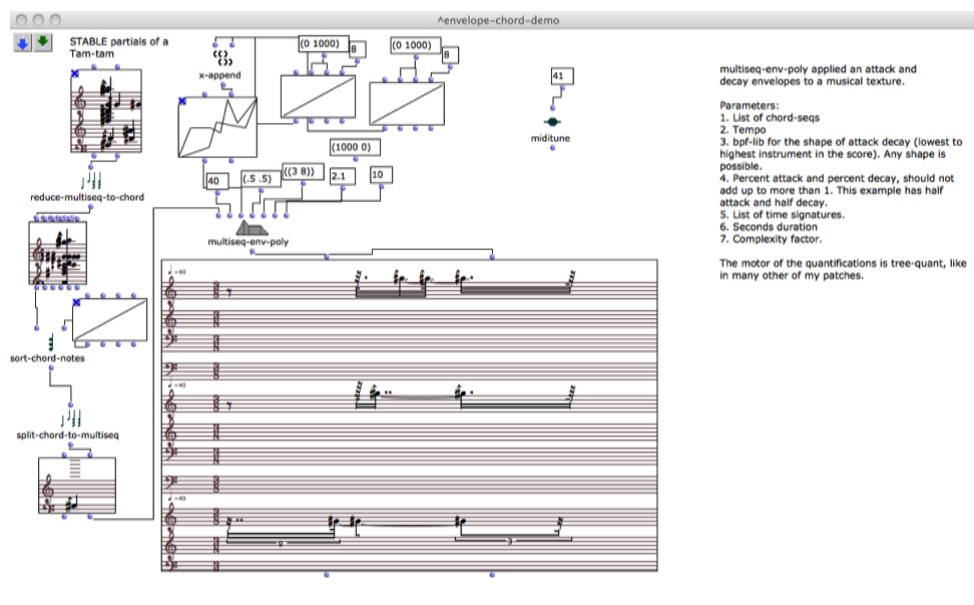


The timbral richness of the sampled sounds can make the chords sound larger than they seem in notation.

Envelopes of attack and decay sculpt these spectral orchestral masses. I have done this on paper in past pieces. This a sketch for a detail of the piece *Circles* (2006), showing visual shapes with approximation to rhythms.



Through work with Open Music, I implemented methods I had so far used on paper, and found new ones, benefiting from the power of rapid calculations from curve shapes. The Open Music envelope functions are doing the same thing. Envelops for attack and decay are drawn.



The shapes are approximated to rhythms.



Inspirations for these envelope shapes were individual attack and decay lines of partials within a timbre.

## Multiphonics morphing

The multiphonics morphing fragments follow similar steps of extracting orchestral harmony from tam-tam spectra. Flute and string notes in the previous category gave rich timbres, limited to sampled long notes. Multiphonic sounds are richer sound phenomena, it is harder to find a "base note" through a sampler logic.

The Catart tools<sup>56</sup> developed at Ircam enable sound categorizations by parameters like high frequency content, mid frequency content, high frequency energy, spectral centroid, spectral flatness, periodicity, loudness, pitch, duration and other sorting criteria. It could offer more flexible classifications of complex sound phenomena.

For this project I have tried to stretch classification by pitch as far as possible, as part of this project is exploration of tuning systems. Even though there were cases neither a pitch analysis nor my ears could be sure about a single reference pitch. The notations are in these cases useful to generate results, not as a sufficient representations of a sound.

"A common approach to sound-composition is to define "instruments" - either by manipulating factory patches on a commercial synthesizer, or by recording sounds on a sampler - and then trigger and transpose these sounds from a MIDI keyboard (or some other kind of MIDI controller). Many composers are either forced into this approach, or do not see beyond it, because cheaply available technology is based on the note/instrument conception of music. At its simplest such an approach is no more than traditional note-oriented composition for electronic instruments, particularly where the MIDI interface confines the user to the tempered scale." <sup>57</sup>

A possible conflict exists between composing with notes or timbres. Tunings systems can create transitional zones between chords and timbres, perceptions of fine nuances of intonation require multiple sounds with centered pitch. It will be possible to apply timbral transitions and spatializations to individual parts of these virtual orchestras, and the "instruments" of this orchestra can be any kind of sounds. A work can maneuver between work on melody and harmony, and transition into multidimensional timbral phenomena.

There were two groups of multiphonic sounds.

- Woodwind multiphonics (a few selected multiphonics on flute, oboe, clarinet and bassoon).
- Contrabass multiphonics. Håkon Thelin<sup>58</sup> has specialized in new techniques for the contrabass. Harmonic finger pressure and detailed control over bowing techniques at harmonic nodes along the strings enable stable multiphonic sounds, in some cases almost comparable to those of the woodwind instruments. We recorded:
  - Stable multiphonics.
  - Transitions from multiphonics to crush notes.

Morphing sounds between these two types of sounds made the source sounds less recognizable. Reasons may be:

- The sounds do not have clear centered pitches, but harmonies and timbres. Even though vaguely similar reference pitches have been attempted, the sounds are not similar enough for smooth transitions. The results could not be confused with acoustic instruments.
- The contrabass sounds are generally shorter than the woodwind sounds. The FFT<sup>59</sup> stretches are audible, and the contrabass is less recognizable than the woodwinds.

The goal may not necessarily be realism, but finding different degrees of familiarity through transformations.

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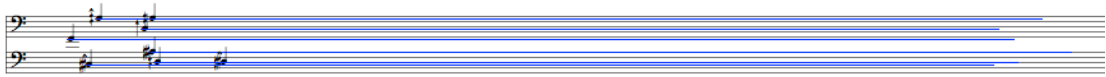
<sup>56</sup> <http://imtr.ircam.fr/imtr/CataRT>

<sup>57</sup> Trevor Wishart, 1994, Audible design, p. 2.

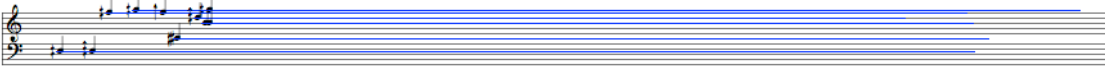
<sup>58</sup> <http://haakonthelein.com/multiphonics/>

<sup>59</sup> Fast Fourier Transform.

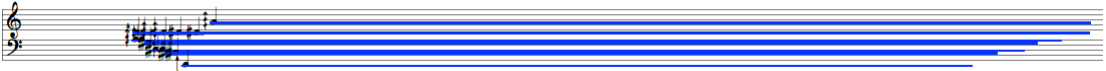
CD Track 4: Multiphonics-morphing 13.



CD Track 5: Multiphonics-morphing 47.



CD Track 6: Multiphonics-morphing 58.



CD Track 7: Multiphonics-morphing 70.



CD Track 8: Multiphonics-morphing 77.

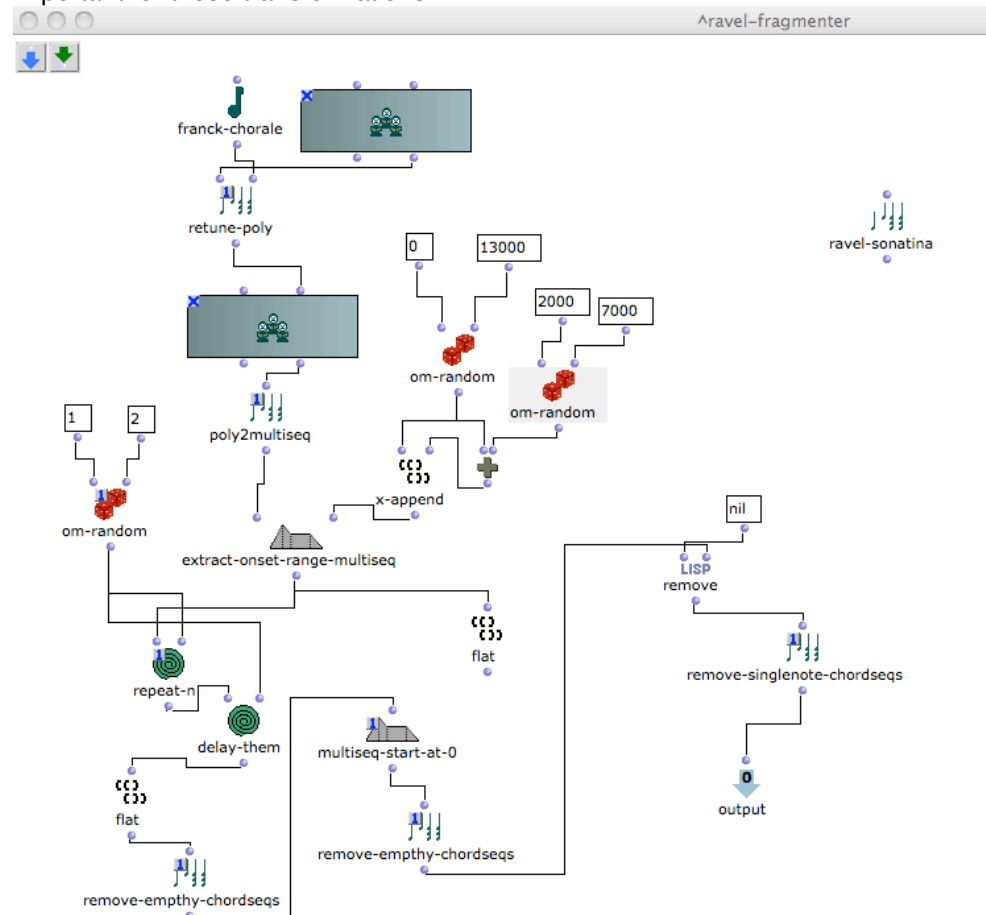


A virtual morphing orchestra can for future projects involve many more orchestral timbres, within traditional and extended techniques. I have for these sound installation fragments chosen to narrow the range of sounds down to these few selected string and woodwind sonorities.



# Gamelan Ravel and Ravel percussion

In this installation the Sonatina in F# minor by Ravel goes through hundreds of transformations, or musical 'morphings'. It becomes a fixed point to be "distorted in intonation and rhythm".<sup>60</sup> In most cases the original cannot be recognized. Open Music became important for these transformations.<sup>61</sup>



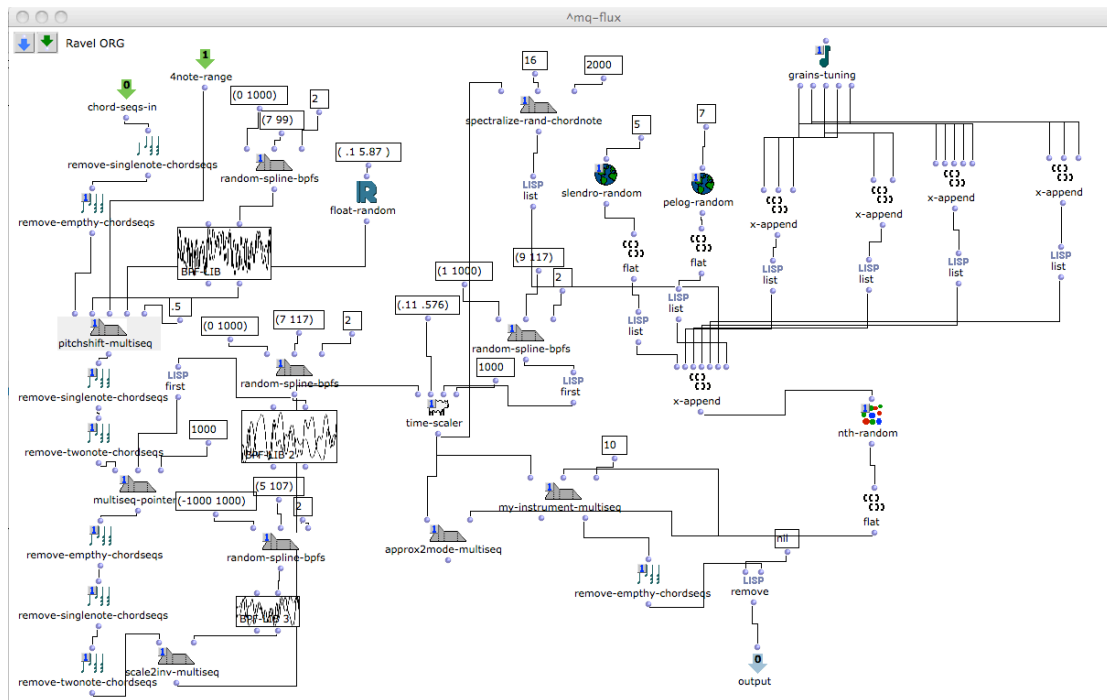
- The original Ravel fragment is tuned to the 'Franck chorale' tuning used in the microtonal organ.<sup>62</sup> A temperament not too distant in time from Ravel can contribute to sonorities of the music.
- Some versions go directly to the next processes. After some time I added a musical 'granulation' to the versions.<sup>63</sup> Instead of processing the chronological original, random extracts of Ravel were superposed with individual delays, to create textures which are more dense, unpredictable, and variable in lengths. The 'granulated' quotations often have more than the original 5 parts.

<sup>60</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*, p. 3.

<sup>61</sup> Ruben Sverre Gjertsen, 2013, *The Ruben-OM patch library*. <http://www.bek.no/~ruben/research.html>

<sup>62</sup> The microtonal organ manual and tuning documentation is available here: <http://www.bek.no/~ruben/research.html>

<sup>63</sup> Ruben Sverre Gjertsen, 2013, *The Ruben-OM patch library*, p. 61.



- The whole range and pitch space is distorted through pitch shifting.<sup>64</sup>
- The chronology of the already disintegrated music is altered through a chaotic time pointer curve.<sup>65</sup>
- The music is scaled by a curve between original and inversion.<sup>66</sup> In sketches and patches, transformations by time pointer and inversion curve were named "MQ flux". Modus Quaternion offers four variations of a material, through static changes in pitch and time domains. With curve shapes as controllers, there are no longer just four, but an infinite number of versions.
- A tempo curve adjusts the speed.<sup>67</sup>
- The now thoroughly distorted pitches are approximated to a number of possible tuning principles. Multiple versions of a tuning type are joined to form denser and more microtonal approximations. Tunings systems can give the music more modal and resonant colours.
  - Random scales of javanese slendro intervals, with 5 transpositions by the same slendro intervals. Similar slendro randoms are available in the microtonal organ, but orders of intervals will here be unique for each fragment.<sup>68</sup>
  - Random scales of javanese pelog intervals, with 7 transpositions by pelog intervals.<sup>69</sup>
  - The 'grains tuning expansion' from the microtonal organ, on 2, 3 or 5 parallel concert pitches.<sup>70</sup>
  - A random note from the input is transposed down as a very deep virtual fundamental.<sup>71</sup> All other notes are approximated to this overtone series.

<sup>64</sup> The Ruben-OM function *pitchshift-multiseq*.

<sup>65</sup> The Ruben-OM function *multiseq-pointer*.

<sup>66</sup> The Ruben-OM function *scale2inv-multiseq*.

<sup>67</sup> The Ruben-OM function *time-scaler*.

<sup>68</sup> Ruben Sverre Gjertsen, 2013, 3 Manual Microtonal Organ, p. 9.

<sup>69</sup> Ibid. p. 9.

<sup>70</sup> Ibid. p. 15.

<sup>71</sup> The Ruben-OM function *spectralize-rand-chordnote*.



gamelan ensemble.<sup>73</sup> The total range of these percussion instruments is comparable to the range of a piano. The western percussion instruments are equal tempered, while the gamelan instruments are tuned in slendro or pelog. When sampled pitches are retuned for the fragments, this important intonation difference is no longer relevant, all instruments can take part in a homogenous virtual ensemble. Samples are normalized through a csound score.<sup>74</sup> Some times this can cause problems balancing the samples. A low register flute at the same dynamic level as a high register flute will not sound realistic. The gamelan kempuls gongs and slentem<sup>75</sup> got very dominant in the first csound synthesis attempts. I solved this by dividing amplitudes within a certain range, and in some cases randomly reduce the amount of notes within a certain register.<sup>76</sup> These are the samples:

- Glockenspiel
  - Dead strike.
- Vibraphone.
  - Played mf with hard sticks (secco, short and long notes).
  - Played mp with hard sticks.
  - Played with soft sticks (1 second and 1/2 second notes).
  - Dead strike.
  - Played with a soft stick with a metal stick is resting on the keys. The result is a metal buzzing sound.
- Marimba.
  - Secco.
  - Dead strike.
- Gamelan ensemble:
  - Slentem.
  - Saron demung.
  - Saron barung.
  - Saron panerus (peking).
  - Bonang barung.
  - Bonang panerus.
  - Kenong.
  - Ketuk.
  - Kempyang.
  - Kempul, gong ageng, gong suwakan.

At early stages, Ravel transformations were tried out "reproduced as drops of water",<sup>77</sup> or morphing between percussion and flute sounds. None of these worked as well as I had imagined, and I ended up with a pure ensemble of percussion.

- FFT<sup>78</sup> processing was not too successful and homogenous for transposition of these percussive sounds. Instead, the speed of the samples were adjusted to fit the intonation.<sup>79</sup>
- Each note has it's own spatial position, with a fade between several different reverbs. To keep a balance, notes were placed along the sides of the virtual room, not in the centre, and not too distant. A few percussionists performing would come from a more narrow locations than a string orchestra. These percussion fragments have the spatial behaviour of rain, and are thus not merely realistic virtual ensembles.

The first Ravel percussion versions are similar to the Gamelan-Ravel fragments, but kept in a higher registers on only the glockenspiel, vibraphone and marimba samples. These sounds were easier to balance than the gamelan samples, and filtering or balancing of registers were

<sup>73</sup> The gamelan samples are from the Marsudi Raras ensemble. I used the freely available samples at <http://www.marsudiraras.org/>, with additional editing and noise reduction through Audiosculpt.

<sup>74</sup> <http://www.csounds.com/>

<sup>75</sup> Deep metallophone.

<sup>76</sup> The Ruben-OM function *bandpass-percent-multiseq*.

<sup>77</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*, p.3.

<sup>78</sup> Fast Fourier Transform.

<sup>79</sup> The csound opcode *diskin*: <http://www.csounds.com/manual/html/diskin.html>

not that necessary. There are more elegant technologies for this, which I will look into for future projects.

We will look at some fragments with 1/8-tone or 1/16-tone approximations. Intonations for synthesis are more precise. First the original Ravel quotation, which is a source for all the transformations. The amount of activity within each part can be recognized even in transformations far removed from the original: Usually, the accompanying second part will be the most active.

CD Track 9: Ravel Sonatina fragment for virtual percussion ensemble, in the 'Franck chorale' temperament.

The image displays a musical score for a virtual percussion ensemble, consisting of two systems of six staves each. Each staff is marked with a tempo of 60 and a 2/4 time signature. The score is written in a key with one sharp (F#). The first system contains measures 1 through 3, and the second system contains measures 4 through 6. The notation is complex, featuring many beamed sixteenth and thirty-second notes, suggesting a fast, rhythmic piece. The percussion parts are represented by various note values and rests across the staves.

6

System 6 of a musical score. It consists of six staves. The first staff (treble clef) begins with a measure containing a half note G#4 and a whole note F#4. The second staff (bass clef) contains a continuous eighth-note accompaniment pattern. The third staff (treble clef) is empty. The fourth staff (bass clef) contains a half note G#2 and a whole note F#2. The fifth staff (treble clef) contains a half note G#3 and a whole note F#3. The sixth staff (bass clef) contains a half note G#1 and a whole note F#1.

8

System 8 of a musical score. It consists of six staves. The first staff (treble clef) begins with a measure containing a half note G#4 and a whole note F#4. The second staff (bass clef) contains a continuous eighth-note accompaniment pattern. The third staff (treble clef) is empty. The fourth staff (bass clef) contains a half note G#2 and a whole note F#2. The fifth staff (treble clef) contains a half note G#3 and a whole note F#3. The sixth staff (bass clef) contains a half note G#1 and a whole note F#1.

10

This musical score consists of six staves, each with a treble and bass clef. The music is written in a key with one sharp (F#) and a 4/4 time signature. The notation includes various note values (quarter, eighth, and sixteenth notes), rests, and accidentals (sharps and naturals). The first staff features a complex melodic line with many beamed sixteenth notes. The second staff continues this melodic line. The third staff has a more sparse melody with some rests. The fourth staff provides a harmonic accompaniment with longer note values. The fifth and sixth staves provide additional harmonic support with simpler note values. The score is divided into four measures by vertical bar lines.

CD Track 10: Ravel-percussion 63.

The image displays a musical score for a percussion ensemble, identified as 'CD Track 10: Ravel-percussion 63'. The score is organized into two systems, each containing five staves. The notation is dense and complex, characteristic of a percussion score, with many beamed notes and rests. The first system shows a variety of rhythmic patterns across the staves, while the second system continues with similar complexity. The staves are arranged in a vertical column, with a large bracket on the left side of each system indicating the ensemble. The notation includes various note values, rests, and dynamic markings, though the specific details of the notation are not fully legible due to the image resolution.



The image displays a musical score for a 12-voice choir, organized into two systems of six staves each. The notation is in G major (one sharp) and 4/4 time. The first system contains measures 1 through 6, and the second system contains measures 7 through 12. The music features a variety of note values, rests, and complex textures, including dense clusters in the final measures.

CD Track 11: Ravel-percussion 192.

The image displays a musical score for CD Track 11, titled "Ravel-percussion 192." The score is organized into two systems, each containing five staves. The first system begins with a treble clef and a key signature of one sharp (F#). The notation is complex, featuring a variety of note values, rests, and accidentals. The second system continues the musical piece, maintaining the same key signature and notation style. The score is presented in a clear, professional format, suitable for a CD track listing.

A musical score for a string quartet, consisting of six staves. The notation is in treble and bass clefs, featuring various musical notes, rests, and accidentals (sharps and naturals). The score is written in a single system, with a large brace on the left side grouping the staves. The first staff has a treble clef and a key signature of one sharp (F#). The second staff has a bass clef and a key signature of one sharp (F#). The third staff has a treble clef and a key signature of one sharp (F#). The fourth staff has a bass clef and a key signature of one sharp (F#). The fifth staff has a treble clef and a key signature of one sharp (F#). The sixth staff has a bass clef and a key signature of one sharp (F#). The notation includes various musical notes, rests, and accidentals (sharps and naturals). The score is written in a single system, with a large brace on the left side grouping the staves.

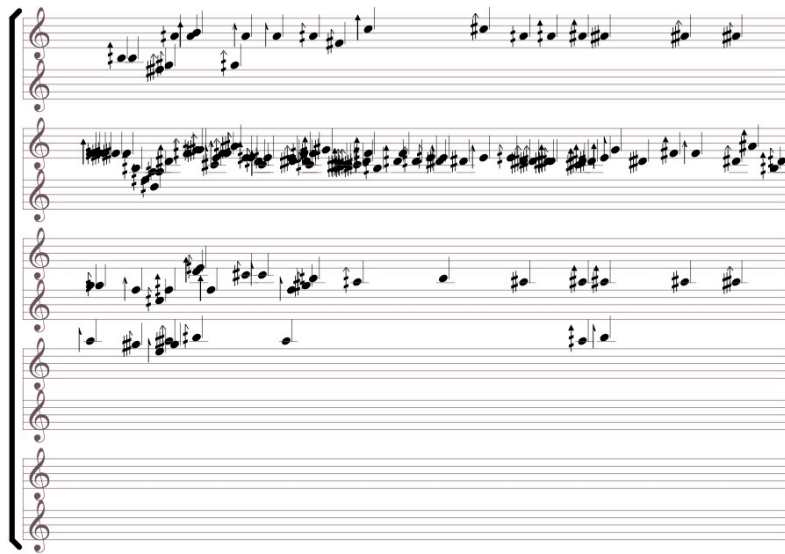
CD Track 12: Gamelan-Ravel 4.

Time pointers can make the music stutter at a particular point of the music, and they introduce rhythmic irregularities I have found interesting.

The actual cent values of the first part reveal more detailed intonations:

(3560 3712 3716 3769 3712 3716 4246 4020 3712 4728 4616 4178 4204 4460 3450 3450 3790 3765 4020 3898 3171 4247 2646 3873 3535 3504 3560 3530 3441 3504 3560 3560 3560 3504 3560 3560 3796 3796 3796 3796 3796 3796 3796 3796 3873 3873 3878 3873 3820 3873 3790 3716 3712 3931 4020)

CD Track 13: Gamelan-Ravel 5.



The first system of musical notation consists of five staves. The top staff features a series of eighth and sixteenth notes, mostly beamed together. The second staff contains a more complex texture with many beamed sixteenth and thirty-second notes. The third staff has a mix of eighth and sixteenth notes. The fourth staff continues with eighth and sixteenth notes. The fifth staff is mostly empty, with a few scattered notes at the end of the system.

The second system of musical notation also consists of five staves. The top staff has a few notes, including a half note and some eighth notes. The second staff is filled with a dense pattern of beamed sixteenth and thirty-second notes. The third staff contains eighth and sixteenth notes. The fourth staff has a few notes, including a half note and some eighth notes. The fifth staff is mostly empty, with a few notes at the end of the system.

The third system of musical notation consists of five staves. The top staff has a few notes, including a half note and some eighth notes. The second staff is filled with a dense pattern of beamed sixteenth and thirty-second notes. The third staff contains eighth and sixteenth notes. The fourth staff has a few notes, including a half note and some eighth notes. The fifth staff is mostly empty, with a few notes at the end of the system.

System 1: A system of five staves. The first staff (treble clef) contains a sequence of notes: F#4, G#4, A4, B4, C5, D5, E5, F#5, G#5, A5, B5, C6, D6, E6, F#6, G#6, A6, B6, C7, D7, E7, F#7, G#7, A7, B7, C8, D8, E8, F#8, G#8, A8, B8, C9, D9, E9, F#9, G#9, A9, B9, C10, D10, E10, F#10, G#10, A10, B10, C11, D11, E11, F#11, G#11, A11, B11, C12, D12, E12, F#12, G#12, A12, B12, C13, D13, E13, F#13, G#13, A13, B13, C14, D14, E14, F#14, G#14, A14, B14, C15, D15, E15, F#15, G#15, A15, B15, C16, D16, E16, F#16, G#16, A16, B16, C17, D17, E17, F#17, G#17, A17, B17, C18, D18, E18, F#18, G#18, A18, B18, C19, D19, E19, F#19, G#19, A19, B19, C20, D20, E20, F#20, G#20, A20, B20, C21, D21, E21, F#21, G#21, A21, B21, C22, D22, E22, F#22, G#22, A22, B22, C23, D23, E23, F#23, G#23, A23, B23, C24, D24, E24, F#24, G#24, A24, B24, C25, D25, E25, F#25, G#25, A25, B25, C26, D26, E26, F#26, G#26, A26, B26, C27, D27, E27, F#27, G#27, A27, B27, C28, D28, E28, F#28, G#28, A28, B28, C29, D29, E29, F#29, G#29, A29, B29, C30, D30, E30, F#30, G#30, A30, B30, C31, D31, E31, F#31, G#31, A31, B31, C32, D32, E32, F#32, G#32, A32, B32, C33, D33, E33, F#33, G#33, A33, B33, C34, D34, E34, F#34, G#34, A34, B34, C35, D35, E35, F#35, G#35, A35, B35, C36, D36, E36, F#36, G#36, A36, B36, C37, D37, E37, F#37, G#37, A37, B37, C38, D38, E38, F#38, G#38, A38, B38, C39, D39, E39, F#39, G#39, A39, B39, C40, D40, E40, F#40, G#40, A40, B40, C41, D41, E41, F#41, G#41, A41, B41, C42, D42, E42, F#42, G#42, A42, B42, C43, D43, E43, F#43, G#43, A43, B43, C44, D44, E44, F#44, G#44, A44, B44, C45, D45, E45, F#45, G#45, A45, B45, C46, D46, E46, F#46, G#46, A46, B46, C47, D47, E47, F#47, G#47, A47, B47, C48, D48, E48, F#48, G#48, A48, B48, C49, D49, E49, F#49, G#49, A49, B49, C50, D50, E50, F#50, G#50, A50, B50, C51, D51, E51, F#51, G#51, A51, B51, C52, D52, E52, F#52, G#52, A52, B52, C53, D53, E53, F#53, G#53, A53, B53, C54, D54, E54, F#54, G#54, A54, B54, C55, D55, E55, F#55, G#55, A55, B55, C56, D56, E56, F#56, G#56, A56, B56, C57, D57, E57, F#57, G#57, A57, B57, C58, D58, E58, F#58, G#58, A58, B58, C59, D59, E59, F#59, G#59, A59, B59, C60, D60, E60, F#60, G#60, A60, B60, C61, D61, E61, F#61, G#61, A61, B61, C62, D62, E62, F#62, G#62, A62, B62, C63, D63, E63, F#63, G#63, A63, B63, C64, D64, E64, F#64, G#64, A64, B64, C65, D65, E65, F#65, G#65, A65, B65, C66, D66, E66, F#66, G#66, A66, B66, C67, D67, E67, F#67, G#67, A67, B67, C68, D68, E68, F#68, G#68, A68, B68, C69, D69, E69, F#69, G#69, A69, B69, C70, D70, E70, F#70, G#70, A70, B70, C71, D71, E71, F#71, G#71, A71, B71, C72, D72, E72, F#72, G#72, A72, B72, C73, D73, E73, F#73, G#73, A73, B73, C74, D74, E74, F#74, G#74, A74, B74, C75, D75, E75, F#75, G#75, A75, B75, C76, D76, E76, F#76, G#76, A76, B76, C77, D77, E77, F#77, G#77, A77, B77, C78, D78, E78, F#78, G#78, A78, B78, C79, D79, E79, F#79, G#79, A79, B79, C80, D80, E80, F#80, G#80, A80, B80, C81, D81, E81, F#81, G#81, A81, B81, C82, D82, E82, F#82, G#82, A82, B82, C83, D83, E83, F#83, G#83, A83, B83, C84, D84, E84, F#84, G#84, A84, B84, C85, D85, E85, F#85, G#85, A85, B85, C86, D86, E86, F#86, G#86, A86, B86, C87, D87, E87, F#87, G#87, A87, B87, C88, D88, E88, F#88, G#88, A88, B88, C89, D89, E89, F#89, G#89, A89, B89, C90, D90, E90, F#90, G#90, A90, B90, C91, D91, E91, F#91, G#91, A91, B91, C92, D92, E92, F#92, G#92, A92, B92, C93, D93, E93, F#93, G#93, A93, B93, C94, D94, E94, F#94, G#94, A94, B94, C95, D95, E95, F#95, G#95, A95, B95, C96, D96, E96, F#96, G#96, A96, B96, C97, D97, E97, F#97, G#97, A97, B97, C98, D98, E98, F#98, G#98, A98, B98, C99, D99, E99, F#99, G#99, A99, B99, C100, D100, E100, F#100, G#100, A100, B100, C101, D101, E101, F#101, G#101, A101, B101, C102, D102, E102, F#102, G#102, A102, B102, C103, D103, E103, F#103, G#103, A103, B103, C104, D104, E104, F#104, G#104, A104, B104, C105, D105, E105, F#105, G#105, A105, B105, C106, D106, E106, F#106, G#106, A106, B106, C107, D107, E107, F#107, G#107, A107, B107, C108, D108, E108, F#108, G#108, A108, B108, C109, D109, E109, F#109, G#109, A109, B109, C110, D110, E110, F#110, G#110, A110, B110, C111, D111, E111, F#111, G#111, A111, B111, C112, D112, E112, F#112, G#112, A112, B112, C113, D113, E113, F#113, G#113, A113, B113, C114, D114, E114, F#114, G#114, A114, B114, C115, D115, E115, F#115, G#115, A115, B115, C116, D116, E116, F#116, G#116, A116, B116, C117, D117, E117, F#117, G#117, A117, B117, C118, D118, E118, F#118, G#118, A118, B118, C119, D119, E119, F#119, G#119, A119, B119, C120, D120, E120, F#120, G#120, A120, B120, C121, D121, E121, F#121, G#121, A121, B121, C122, D122, E122, F#122, G#122, A122, B122, C123, D123, E123, F#123, G#123, A123, B123, C124, D124, E124, F#124, G#124, A124, B124, C125, D125, E125, F#125, G#125, A125, B125, C126, D126, E126, F#126, G#126, A126, B126, C127, D127, E127, F#127, G#127, A127, B127, C128, D128, E128, F#128, G#128, A128, B128, C129, D129, E129, F#129, G#129, A129, B129, C130, D130, E130, F#130, G#130, A130, B130, C131, D131, E131, F#131, G#131, A131, B131, C132, D132, E132, F#132, G#132, A132, B132, C133, D133, E133, F#133, G#133, A133, B133, C134, D134, E134, F#134, G#134, A134, B134, C135, D135, E135, F#135, G#135, A135, B135, C136, D136, E136, F#136, G#136, A136, B136, C137, D137, E137, F#137, G#137, A137, B137, C138, D138, E138, F#138, G#138, A138, B138, C139, D139, E139, F#139, G#139, A139, B139, C140, D140, E140, F#140, G#140, A140, B140, C141, D141, E141, F#141, G#141, A141, B141, C142, D142, E142, F#142, G#142, A142, B142, C143, D143, E143, F#143, G#143, A143, B143, C144, D144, E144, F#144, G#144, A144, B144, C145, D145, E145, F#145, G#145, A145, B145, C146, D146, E146, F#146, G#146, A146, B146, C147, D147, E147, F#147, G#147, A147, B147, C148, D148, E148, F#148, G#148, A148, B148, C149, D149, E149, F#149, G#149, A149, B149, C150, D150, E150, F#150, G#150, A150, B150, C151, D151, E151, F#151, G#151, A151, B151, C152, D152, E152, F#152, G#152, A152, B152, C153, D153, E153, F#153, G#153, A153, B153, C154, D154, E154, F#154, G#154, A154, B154, C155, D155, E155, F#155, G#155, A155, B155, C156, D156, E156, F#156, G#156, A156, B156, C157, D157, E157, F#157, G#157, A157, B157, C158, D158, E158, F#158, G#158, A158, B158, C159, D159, E159, F#159, G#159, A159, B159, C160, D160, E160, F#160, G#160, A160, B160, C161, D161, E161, F#161, G#161, A161, B161, C162, D162, E162, F#162, G#162, A162, B162, C163, D163, E163, F#163, G#163, A163, B163, C164, D164, E164, F#164, G#164, A164, B164, C165, D165, E165, F#165, G#165, A165, B165, C166, D166, E166, F#166, G#166, A166, B166, C167, D167, E167, F#167, G#167, A167, B167, C168, D168, E168, F#168, G#168, A168, B168, C169, D169, E169, F#169, G#169, A169, B169, C170, D170, E170, F#170, G#170, A170, B170, C171, D171, E171, F#171, G#171, A171, B171, C172, D172, E172, F#172, G#172, A172, B172, C173, D173, E173, F#173, G#173, A173, B173, C174, D174, E174, F#174, G#174, A174, B174, C175, D175, E175, F#175, G#175, A175, B175, C176, D176, E176, F#176, G#176, A176, B176, C177, D177, E177, F#177, G#177, A177, B177, C178, D178, E178, F#178, G#178, A178, B178, C179, D179, E179, F#179, G#179, A179, B179, C180, D180, E180, F#180, G#180, A180, B180, C181, D181, E181, F#181, G#181, A181, B181, C182, D182, E182, F#182, G#182, A182, B182, C183, D183, E183, F#183, G#183, A183, B183, C184, D184, E184, F#184, G#184, A184, B184, C185, D185, E185, F#185, G#185, A185, B185, C186, D186, E186, F#186, G#186, A186, B186, C187, D187, E187, F#187, G#187, A187, B187, C188, D188, E188, F#188, G#188, A188, B188, C189, D189, E189, F#189, G#189, A189, B189, C190, D190, E190, F#190, G#190, A190, B190, C191, D191, E191, F#191, G#191, A191, B191, C192, D192, E192, F#192, G#192, A192, B192, C193, D193, E193, F#193, G#193, A193, B193, C194, D194, E194, F#194, G#194, A194, B194, C195, D195, E195, F#195, G#195, A195, B195, C196, D196, E196, F#196, G#196, A196, B196, C197, D197, E197, F#197, G#197, A197, B197, C198, D198, E198, F#198, G#198, A198, B198, C199, D199, E199, F#199, G#199, A199, B199, C200, D200, E200, F#200, G#200, A200, B200, C201, D201, E201, F#201, G#201, A201, B201, C202, D202, E202, F#202, G#202, A202, B202, C203, D203, E203, F#203, G#203, A203, B203, C204, D204, E204, F#204, G#204, A204, B204, C205, D205, E205, F#205, G#205, A205, B205, C206, D206, E206, F#206, G#206, A206, B206, C207, D207, E207, F#207, G#207, A207, B207, C208, D208, E208, F#208, G#208, A208, B208, C209, D209, E209, F#209, G#209, A209, B209, C210, D210, E210, F#210, G#210, A210, B210, C211, D211, E211, F#211, G#211, A211, B211, C212, D212, E212, F#212, G#212, A212, B212, C213, D213, E213, F#213, G#213, A213, B213, C214, D214, E214, F#214, G#214, A214, B214, C215, D215, E215, F#215, G#215, A215, B215, C216, D216, E216, F#216, G#216, A216, B216, C217, D217, E217, F#217, G#217, A217, B217, C218, D218, E218, F#218, G#218, A218, B218, C219, D219, E219, F#219, G#219, A219, B219, C220, D220, E220, F#220, G#220, A220, B220, C221, D221, E221, F#221, G#221, A221, B221, C222, D222, E222, F#222, G#222, A222, B222, C223, D223, E223, F#223, G#223, A223, B223, C224, D224, E224, F#224, G#224, A224, B224, C225, D225, E225, F#225, G#225, A225, B225, C226, D226, E226, F#226, G#226, A226, B226, C227, D227, E227, F#227, G#227, A227, B227, C228, D228, E228, F#228, G#228, A228, B228, C229, D229, E229, F#229, G#229, A229, B229, C230, D230, E230, F#230, G#230, A230, B230, C231, D231, E231, F#231, G#231, A231, B231, C232, D232, E232, F#232, G#232, A232, B232, C233, D233, E233, F#233, G#233, A233, B233, C234, D234, E234, F#234, G#234, A234, B234, C235, D235, E235, F#235, G#235, A235, B235, C236, D236, E236, F#236, G#236, A236, B236, C237, D237, E237, F#237, G#237, A237, B237, C238, D238, E238, F#238, G#238, A238, B238, C239, D239, E239, F#239, G#239, A239, B239, C240, D240, E240, F#240, G#240, A240, B240, C241, D241, E241, F#241, G#241, A241, B241, C242, D242, E242, F#242, G#242, A242, B242, C243, D243, E243, F#243, G#243, A243, B243, C244, D244, E244, F#244, G#244, A244, B244, C245, D245, E245, F#245, G#245, A245, B245, C246, D246, E246, F#246, G#246, A246, B246, C247, D247, E247, F#247, G#247, A247, B247, C248, D248, E248, F#248, G#248, A248, B248, C249, D249, E249, F#249, G#249, A249, B249, C250, D250, E250, F#250, G#250, A250, B250, C251, D251, E251, F#251, G#251, A251, B251, C252, D252, E252, F#252, G#252, A252, B252, C253, D253, E253, F#253, G#253, A253, B253, C254, D254, E254, F#254, G#254, A254, B254, C255, D255, E255, F#255, G#255, A255, B255, C256, D256, E256, F#256, G#256, A256, B256, C257, D257, E257, F#257, G#257, A257, B257, C258, D258, E258, F#258, G#258, A258, B258, C259, D259, E259, F#259, G#259, A259, B259, C260, D260, E260, F#260, G#260, A260, B260, C261, D261, E261, F#261, G#261, A261, B261, C262, D262, E262, F#262, G#262, A262, B262, C263, D263, E263, F#263, G#263, A263, B263, C264, D264, E264, F#264, G#264, A264, B264, C265, D265, E265, F#265, G#265, A265, B265, C266, D266, E266, F#266, G#266, A266, B266, C267, D267, E267, F#267, G#267, A267, B267, C268, D268, E268, F#268, G#268, A268, B268, 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A291, B291, C292, D292, E292, F#292, G#292, A292, B292, C293, D293, E293, F#293, G#293, A293, B293, C294, D294, E294, F#294, G#294, A294, B294, C295, D295, E295, F#295, G#295, A295, B295, C296, D296, E296, F#296, G#296, A296, B296, C297, D297, E297, F#297, G#297, A297, B297, C298, D298, E298, F#298, G#298, A298, B298, C299, D299, E299, F#299, G#299, A299, B299, C300, D300, E300, F#300, G#300, A300, B300, C301, D301, E301, F#301, G#301, A301, B301, C302, D302, E302, F#302, G#302, A302, B302, C303, D303, E303, F#303, G#303, A303, B303, C304, D304, E304, F#304, G#304, A304, B304, C305, D305, E305, F#305, G#305, A305, B305, C306, D306, E306, F#306, G#306, A306, B306, C307, D307, E307, F#307, G#307, A307, B307, C308, D308, E308, F#308, G#308, A308, B308, C309, D309, E309, F#309, G#309, A309, B309, C310, D310, E310, F#310, G#310, A310, B310, C311, D311, E311, F#311, G#311, A311, B311, C312, D312, E312, F#312, G#312, A312, B312, C313, D313, E313, F#313, G#313, A313, B313, C314, D314, E314, 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D337, E337, F#337, G#337, A337, B337, C338, D338, E338, F#338, G#338, A338, B338, C339, D339, E339, F#339, G#339, A339, B339, C340, D340, E340, F#340, G#340, A340, B340, C341, D341, E341, F#341, G#341, A341, B341, C342, D342, E342, F#342, G#342, A342, B342, C343, D343, E343, F#343, G#343, A343, B343, C344, D344, E344, F#344, G#344, A344, B344, C345, D345, E345, F#345, G#345, A345, B345, C346, D346, E346, F#346, G#346, A346, B346, C347, D347, E347, F#347, G#347, A347, B347, C348, D348, E348, F#348, G#348, A348, B348, C349, D349, E349, F#349, G#349, A349, B349, C350, D350, E350, F#350, G#350, A350, B350, C351, D351, E351, F#351, G#351, A351, B351, C352, D352, E352, F#352, G#352, A352, B352, C353, D353, E353, F#353, G#353, A353, B353, C354, D354, E354, F#

CD Track 14: Gamelan-Ravel 51 (in a random pelog tuning).

The image displays a musical score for CD Track 14, titled "Gamelan-Ravel 51 (in a random pelog tuning)". The score is written for a 12-part ensemble, organized into six systems, each with two staves (treble and bass clef). The notation is a form of Western musical notation adapted for gamelan music, featuring various note values, rests, and accidentals (sharps and naturals) to represent the specific pitches of the instruments in a random pelog tuning. The music is characterized by its polyphonic texture, with multiple voices moving in parallel motion. The first system shows a dense texture with many notes, while subsequent systems show more sparse, punctuated textures. The notation includes many accidentals, indicating a non-standard tuning. The score is presented on a white background with black musical notation.



## Jet whistle horn pheasant

The *jet whistle horn pheasant* fragments involve mixed ensembles of short and dry sounds, half instrument and half animal. Hybrid ensembles can be formed, instruments coexist with animals or 'become animal'. If instrumental uses of sounds take them out of their recognizable habitats, a focus can be shifted to a process of 'becoming' something else. How will the isolated duck in a virtual room be different from an instrument?

"Becomings-animal are neither dreams nor phantasies. They are perfectly real. But which reality is at issue here? For if becoming animal does not consist in playing animal or imitating an animal, it is clear that the human being does not "really" become an animal any more than the animal "really" becomes something else. Becoming produces nothing other than itself. (...) What is real is the becoming itself, the block of becoming, not the supposedly fixed terms through which that which becomes passes."<sup>80</sup>

The materials are specific outbursts from 6 groups:

- 1: Microtonally descending phrases performed by jet whistles on flute and alto flute.
- 2: Occasional notes performed by a pheasant flapping its wings.
- 3: Rapid phrases of variable tessitura performed by secco sounds qualities on flutes:
  - Slaptongue on piccolo, flute and alto flute.
  - Lip pizzicato on flute and alto flute.
  - Tongue ram on flute.
  - Key clicks on alto flute.
- 4: Rapid phrases of variable tessitura performed by a mixed ensemble of instruments and animals, all samples of less than a second:
  - Short duck "bark".
  - Electric sound.
  - Flute tongue ram.
  - Woodpecker.
  - Short crisp sound found through processing of glass sounds.
  - Clacking glasses.
  - Nightingale "ratchet" sound.
  - Tuba slaptongue.
  - Violin short legno battuto.
  - Bush-cricket.
- 5: Outbursts of horn attacks, from hand stop to open. The hand movements create ascending glissandi on all notes.
- 6: Rapid phrases of variable tessitura are performed by staccato notes on piccolo, flute and alto flute.

All sounds are transposed through melodic phrases, even though pitches of woodpecker, glass sounds, and cricket are less perceptible. Classification by pitch gets highly speculative. Subtle microtonal tuning nuances are much less effective with noise sounds than with centered pitch sounds. Still, general patterns between high and low do make a difference. A miniature bush-cricket is a different animal than a giant bush-cricket.

In the work *Les Froissements d'Ailes de Gabriel*, Brian Ferneyhough associated the rustling of wings to Pauls Klee's *Angelus Novus*, by Walter Benjamin interpreted as the 'Angel of history', and composed a work with whirling instrumental figures.<sup>81</sup> These installation fragments place concrete flapping of wings into constantly varied virtual spaces. Different associations can arise with a pheasant flapping its wings in a tiny and resonant bathroom or in a giant cave. At certain points it could form a 'Klang-kadenz'<sup>82</sup> for fragments of instruments and animals.

<sup>80</sup> Deleuze, 1987, a thousand plateaus, p. 238.

<sup>81</sup> Toop, Concerto, que me veuz-tu? Booklet text for *Les Froissements d'Ailes...*, p. 13.

<sup>82</sup> Lachenmann, 2004, Musik als existentielle Erfahrung, p. 3.

The following scores are used to generate the fragments of short sounds, while real perception of pitch strongly depend on the sounds involved.

CD Track 15: Jet whistle pheasant 2.

The image displays a musical score for 'Jet whistle pheasant 2', consisting of three systems of staves. Each system includes a grand staff (treble and bass clefs) and a single treble staff. The notation is as follows:

- System 1:** The grand staff contains a few notes at the end of the line, marked with blue '1' fingerings. The single treble staff contains a sequence of notes marked with green '3' fingerings.
- System 2:** The grand staff contains a complex, dense passage of notes marked with orange '4' fingerings. The single treble staff contains a few notes marked with orange '4' fingerings.
- System 3:** The grand staff contains a complex, dense passage of notes marked with orange '4' fingerings. The single treble staff contains a few notes marked with orange '4' fingerings.

CD Track 16: Jet whistle pheasant 8.

CD Track 17: Jet whistle pheasant 35.

The musical score for CD Track 17: Jet whistle pheasant 35 is presented in seven systems of staves. Each system consists of a treble clef staff and a bass clef staff. The music is written in a key with one sharp (F#) and a 2/4 time signature. The notation includes various note values, rests, and fingerings indicated by numbers 1 through 6 in different colors (blue, red, green, orange, pink). The first system shows a melodic line in the treble and a bass line. The second system has a single note in the treble. The third system features a complex melodic line with many triplets. The fourth system has a few notes in the treble. The fifth system has a melodic line in the treble and a bass line. The sixth system has a melodic line in the treble and a bass line. The seventh system has a melodic line in the treble and a bass line.

CD Track 18: Jet whistle pheasant 43.

The first system of the musical score consists of six staves. The first staff contains a short melodic phrase in the treble clef, marked with a blue '1'. The second staff is empty. The third staff contains a complex, fast-moving melodic line in the treble clef, marked with a green '3'. The fourth staff contains a complex, fast-moving melodic line in the bass clef, marked with a green '3'. The fifth staff contains a complex, fast-moving melodic line in the treble clef, marked with an orange '4'. The sixth staff contains a complex, fast-moving melodic line in the bass clef, marked with a red '6'.

The second system of the musical score consists of six staves. The first staff contains a short melodic phrase in the treble clef, marked with a red '2'. The second staff contains a complex, fast-moving melodic line in the treble clef, marked with a green '3'. The third staff contains a complex, fast-moving melodic line in the bass clef, marked with a green '3'. The fourth staff contains a complex, fast-moving melodic line in the treble clef, marked with an orange '4'. The fifth staff contains a complex, fast-moving melodic line in the bass clef, marked with a red '6'. The sixth staff contains a complex, fast-moving melodic line in the treble clef, marked with a green '3'.

The third system of the musical score consists of two staves. The first staff contains a short melodic phrase in the treble clef, marked with a green '3'. The second staff contains a short melodic phrase in the bass clef, marked with a green '3'.

CD Track 19: Jet whistle pheasant 77.

The image shows a musical score for guitar, consisting of five systems of a grand staff (treble and bass clefs). The notation includes various chords and melodic lines with fingerings indicated by numbers 1-5 in different colors. The key signature has one sharp (F#) and the time signature is 4/4. The score is for a piece titled "The Wind" by John Williams.

**System 1:** Treble clef has a whole note chord (F#4, A4, C5) with a blue "1" below it. Bass clef has a whole note chord (F#2, A2, C3) with a blue "1" below it.

**System 2:** Treble clef has a whole note chord (F#4, A4, C5) with a red "2" below it. Bass clef has a whole note chord (F#2, A2, C3) with a red "2" below it.

**System 3:** Treble clef has a whole note chord (F#4, A4, C5) with a green "3" below it. Bass clef has a whole note chord (F#2, A2, C3) with a green "3" below it.

**System 4:** Treble clef has a whole note chord (F#4, A4, C5) with an orange "4" below it. Bass clef has a whole note chord (F#2, A2, C3) with an orange "4" below it.

**System 5:** Treble clef has a whole note chord (F#4, A4, C5) with a purple "5" below it. Bass clef has a whole note chord (F#2, A2, C3) with a purple "5" below it.

CD Track 20: Jet whistle pheasant 94.

The musical score is presented on ten staves, organized into two systems of five staves each. The notation includes treble and bass clefs, a key signature of one sharp (F#), and a time signature of 4/4. The notes are color-coded: blue, green, orange, pink, and red. Fingerings are indicated by numbers 1-5. The score is a complex piece of music, likely for a solo instrument like a flute or a small ensemble.

## Electric bubbles

A sound from FFT distortion of breaking glass I made many years ago is used as an instrument, transposed to microtonal phrases in diverse registers. The sounds are outburst of sinewaves, at different transpositions and speeds, through yet another level of FFT processing in Csound. Sounds are moving like flocks of electric birds through the space, with a variety of reverb types, from dry to resonant. This is the most "electric" and artificial type of sounds involved in *Landscape with figures I*.

CD Track 21: Electric bubbles 16.

CD Track 22: Electric bubbles 102.

## Breaking

This group of fragments is performed by dry breaking sounds and bartok pizzicato of strings. Phrases are created within a range and obscured through time pointers<sup>83</sup> and time scaling,<sup>84</sup> to make phrases less predictable. Sounds are not moving, but placed at random positions along sides of the space, like an orchestra surrounding the audience, with variable reverb types. The sounds are:

- 1: Breaking glass.<sup>85</sup>
- 2: Breaking eggs.
- 3: Breaking wood.
- 4: Strings Bartok pizzicato.

The scores have been used to generate results. Exact pitches are more relevant to the Bartok pizzicato than to the other sounds. Transpositions are done through FFT with time correction. To recreate these percussive sounds, window sizes are often made smaller than usual. This did not keep all sounds from getting blurred or inaudible.

CD Track 23: Breaking 8.



<sup>83</sup> The Ruben-OM function *multiseq-pointer*.

<sup>84</sup> The Ruben-OM function *time-scaler*.

<sup>85</sup> Some of these were recorded by John Hegre.



CD Track 24: Breaking 25.

Four staves of musical notation for CD Track 24. The notation includes various notes and rests, with fingerings indicated by numbers 1, 2, 3, and 4 in different colors (blue, red, green, orange). The first staff has a blue '1' above the first note. The second staff has red '2's above several notes. The third staff has a green '3' above a note. The fourth staff has orange '4's above several notes.

CD Track 25: Breaking 74.

Two systems of musical notation for CD Track 25. The first system consists of four staves. The notation includes various notes and rests, with fingerings indicated by numbers 1, 2, 3, and 4 in different colors (blue, red, green, orange). The second system consists of two staves. The notation includes various notes and rests, with fingerings indicated by numbers 2, 3, and 4 in different colors (red, green, orange).

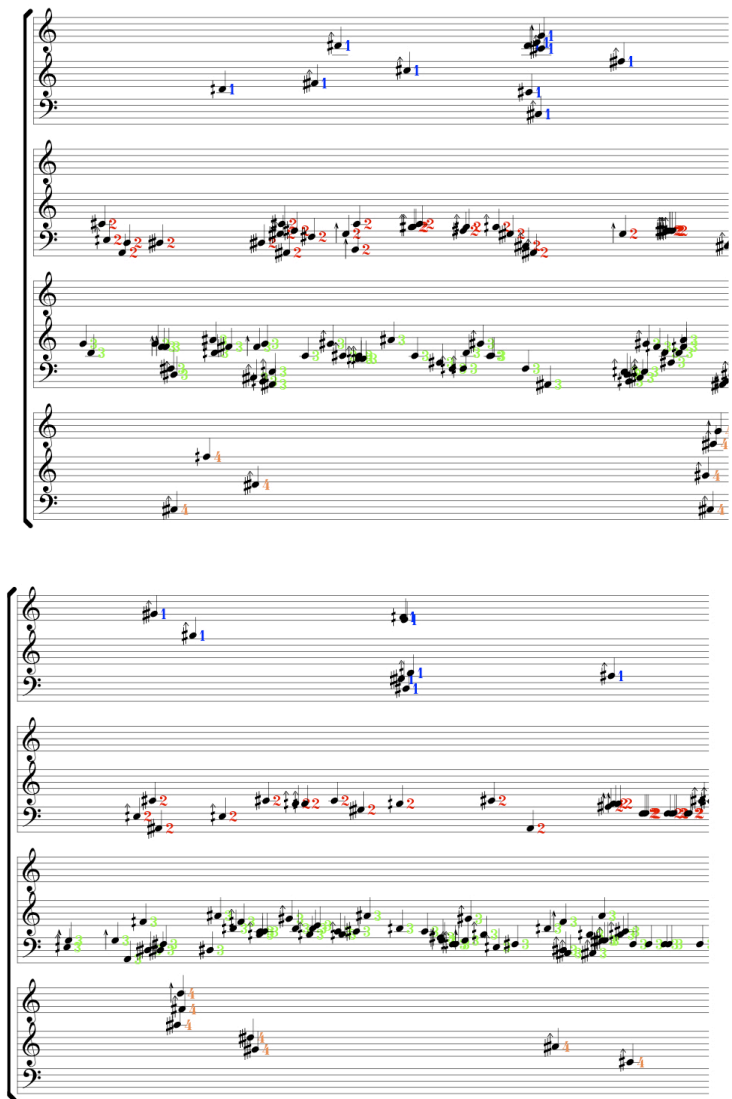
## Distorted breaking

The *distorted breaking* present a similar set of sounds.

- 1: Breaking glass.
- 2: Breaking eggs.
- 3: Breaking wood.
- 4: Grasshopper.

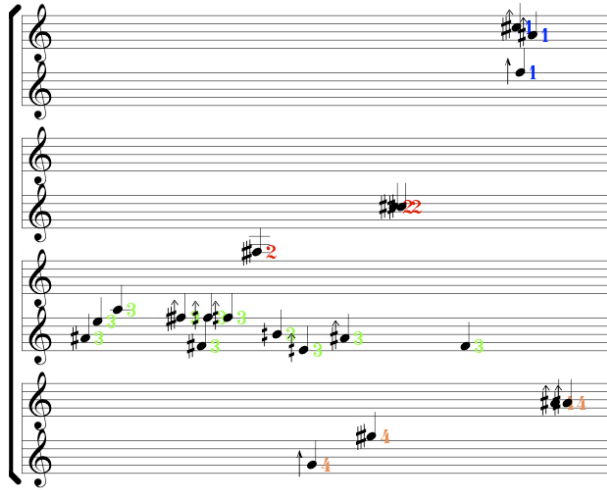
In the *breaking* fragments, the original speed was kept. In this next category, sounds are stretched to many times original length, while FFT window sizes are deliberately set too small. Sounds will react differently. A FFT size of 4096 give some sounds a metallic quality, while window sizes down towards 256 can break sounds into sine waves textures, vaguely resembling the *electric bubbles* fragments. With a larger pitch range, we can finally hear some giant grasshoppers.

CD Track 26: Distorted breaking 18.

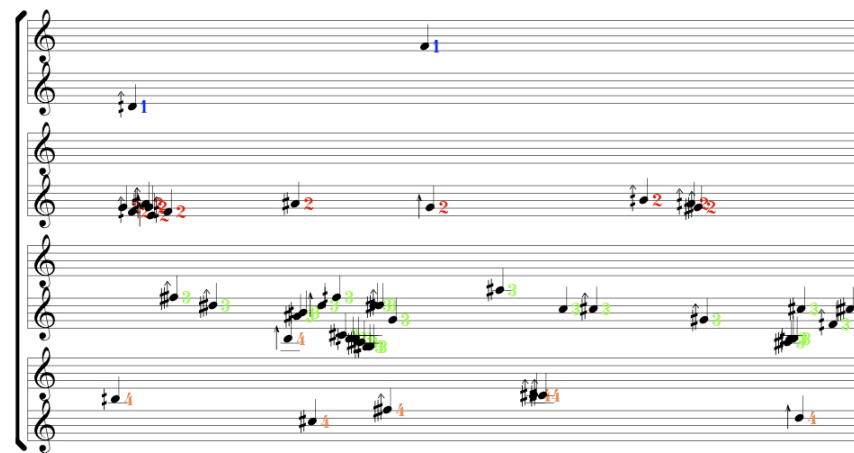


CD Track 27: Distorted breaking 27.

CD Track 27: Distorted breaking 27.

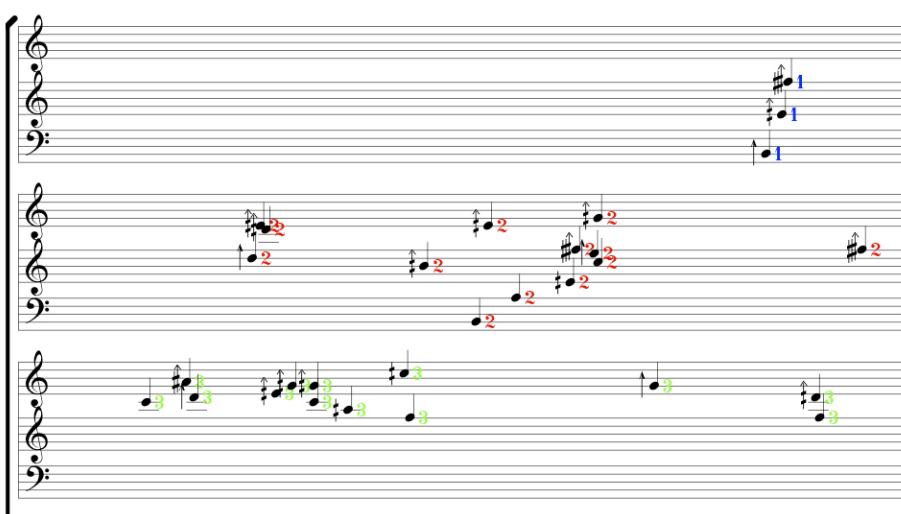
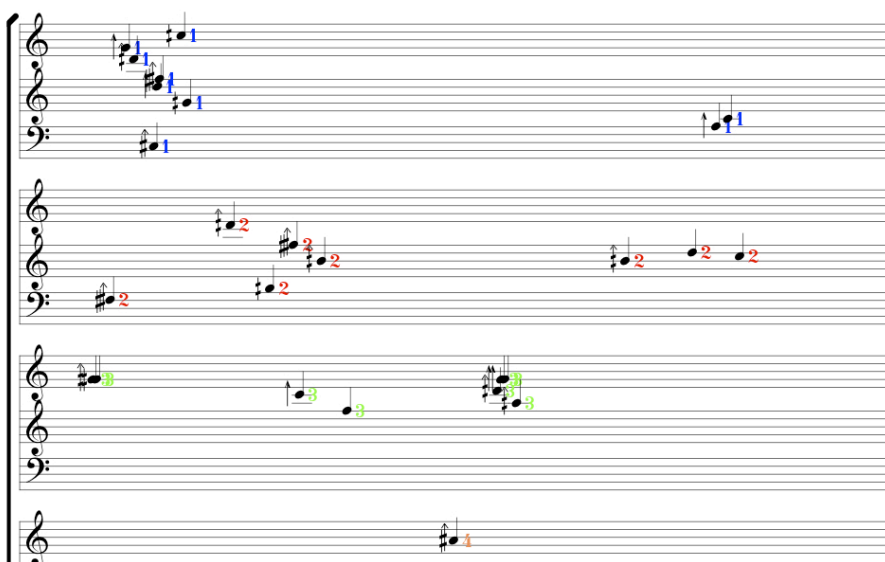


CD Track 28: Distorted breaking 54.





CD Track 29: Distorted breaking 83.



System 1 of a musical score. It consists of three staves. The top staff has a treble clef and a key signature of one sharp (F#). It contains a single measure with a blue note on the first line (F#) and a blue '1' below it. The middle staff has a treble clef and a key signature of one sharp (F#). It contains a sequence of notes with red '2' fingerings. The bottom staff has a treble clef and a key signature of one sharp (F#). It contains a sequence of notes with green '3' fingerings.

System 2 of a musical score. It consists of two staves. The top staff has a treble clef and a key signature of one sharp (F#). It contains a sequence of notes with red '2' fingerings. The bottom staff has a treble clef and a key signature of one sharp (F#). It contains a sequence of notes with green '3' fingerings.

# Ammons water

A poem by A. R. Ammons can offer metaphors for decentralized musical topographies.

## "Conserving the Magnitude of Uselessness"

Spits of glitter in lowgrade ore,  
precious stones too poorly surrounded for harvest,  
to all things not worth the work  
of having,

brush oak on a sharp slope, for example,  
the balk tonnage of woods-lodged boulders,  
the irreparable desert,  
drowned river mouths, lost shores where

the winged and light-footed go,  
take creosote bush that possesses  
ground nothing else will have,  
to all things and for all things

crusty or billowy with indifference,  
for example, incalculable, irremovable water  
or fluvio-glacial deposits  
larch or dwarf aspen in the least breeze sometimes shiver in---

suddenly the salvation of waste betides,  
the peerlessly unsettled seas that shape the continents,  
take the gales wasting and in waste over  
Antarctica and the sundry high shoals of ice,

for the inexcusable (the worthless abundant) the  
merely tiresome, the obviously unimprovable,  
to these and for these and for their undiminishment  
the poets will yelp and hoot forever

probably,  
rank as weeds themselves and just abandoned:  
nothing useful is of lasting value:  
dry wind only is still talking among the oldest stones. <sup>86</sup>

The poem can describe qualities and value of peripheral terrains outside a mainstream of rhetorical importance; these natural elements and terrains do not hold strong speeches concerning their worth. Lights are shed upon the concept of 'usefulness'. Keeping intact habitats for the "winged and light-footed" could be metaphors for a valuable diversity within a musical language. What is visible is not the whole terrain, but what appears from a particular point of view. The work of composition can be the changing perspectives within terrains, transferred to morphologies or spatial perspectives of sounds. Similar to such a natural world, the work can have a multidimensional nature, from the overall topography, to textures, surface qualities and general diversities of wildlife.

This poem is treated in two different ways in these fragments.

- *Ammons text solo*. The poem is:
  - Spoken or whispered through a bassoon.<sup>87</sup> Speaking through the narrow basson reed will obscure the meaning of the text.
  - Whispered through trombones.<sup>88</sup> The meaning will be less distorted, as the larger mouthpiece allows the lips to move more freely.
- Texts go through FFT processes (window size 1024/2048 for a sufficient time resolution to understand some words). There are 3 different treatments:
  - Transposition to score pitches.<sup>89</sup>

<sup>86</sup> Ammons, 2001, Collected poems 1951-1971, p. 291.

<sup>87</sup> Recording sessions with Sjøforsvarets Musikkorps, Bergen. Anthony Ringdal speaks through the basson.

<sup>88</sup> Recording sessions with Sjøforsvarets Musikkorps, Bergen.

<sup>89</sup> *pvscale* in Csound: <http://www.csound.com/manual/html/pvscale.html>

- Transposition with spectral blurring.<sup>90</sup>
- Transposition with spectral arpeggio,<sup>91</sup> formants are kept "using a true envelope method."<sup>92</sup> This usually creates a softer sound with emphasis on high overtones.

The sounds are actively moving through the whole space, with a large selection of reverbs.

CD Track 30: Ammons text solo 8.

CD Track 31: Ammons text solo 16.

CD Track 32: Ammons text solo 17.

- *Ammons text morphing towards bubbles of water.*
  - The poem is whispered through a contrabass clarinet, with additional "speaking" key clicks.<sup>93</sup>
  - Bubbles are blown through straws into different bowls and a kitchen sink filled with water.

These two types of sounds are morphed in Csound<sup>94</sup> through various transition shapes. The results are clearly hybrid sounds, while the bubbling sounds tend to be easier to recognize than the whispering.

CD Track 33: Ammons water 5.

CD Track 34: Ammons water 17.

CD Track 35: Ammons water 58.

At times when the meaning of the text cannot be recognized, the efforts of speaking or whispering will have been transformed to gestures. Voices are moving in and out of the peripheral areas of these terrains.

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<sup>90</sup> *pvsblur* in Csound: <http://www.csounds.com/manual/html/pvsblur.html>

<sup>91</sup> *pvsarp* in Csound: <http://www.csounds.com/manual/html/pvsarp.html>

<sup>92</sup> The parameter *kkeepform* of *pvscale*: <http://www.csounds.com/manual/html/pvscale.html>

<sup>93</sup> Recording session with Rolf Borch.

<sup>94</sup> The Csound opcodes *pvcross*, *pvmix* and *pvsfilter*.



## Trombone, contrabass and drilling sounds morphing

To form ensembles of instruments and everyday sounds in a literal sense, virtual ensembles can be created through chains of associations. I recorded a test of the civil defense sirens in Bergen, as one of the soundscapes. Fragments of trombone, strings and drills are usually inactive in the sound installation, and get triggered whenever the sound of these sirens are heard.

Manipulated tam-tam analysis was used as a pitch material, focused on the deep register of trombone and contrabass. The tam-tam chords form basis for pure transpositions, or morphing between 2 groups of sounds.

- The instruments.
  - Strings performing sul tasto, sul ponticello and harmonics.
  - Cellos and contrabasses fortissimo.
  - Pedal notes on trombone.
  - Tam-tams performed with different sticks.
- The drilling.
  - A dentists drill.
  - Electric hand drill.
  - Pinion drill.
  - Servo drill.
  - Building drill recorded during restoration at Hotel Atlanta.<sup>95</sup>
  - Tam-tams performed with different sticks.

The dentist drill offers a piercing soprano range in this sound family. A jackhammer was first included as a bass of this drill ensemble, but it turned out too violent in the context, especially with resonant reverbs. Tam-tam sounds are included in both groups as a morphing option.

Potential morphological relations exist between the two groups, from the grainy quality of the strings and deep trombones, to the metallic hammering and friction of the drills.

CD Track 36: Trb Cb Drill Morph 11.

CD Track 37: Trb Cb Drill Morph 12.

CD Track 38: Trb Cb Drill Morph 30.

CD Track 39: Trb Cb Drill Morph 33.

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<sup>95</sup> Rue Frochot 9, Paris.

## Soundscapes

These are everyday sounds in the most concrete sense of the word. City environments from Bergen are recorded with a Soundfield microphone.<sup>96</sup> B-format is created<sup>97</sup> from these 4 channel recordings, and perspectives are in constant flux. Curves of jaw, pitch, roll simulate a pilot flying through the environments, giving a sense of a rotating city landscape, where the listener at times is hanging upside down over the city. This was done through Reaper<sup>98</sup> with the Harpex<sup>99</sup> plugin, saved to 8 channel ambisonic sounds, played at the outer circle of speakers of the 16 channel sound installation.

Recorded locations in Bergen were:

- Nordnesparken.
- Bergenhus fortress.
- Skolten.
- Various fountains.
- Lille lungegårdsvann.
- Store lungegårdsvann.
- Fløibanen.
- Fløien.
- Brattlien.

Recordings are made at different times of the year, with variable weather conditions. They are not pure documentations of places, rather situations to be superposed to impossible situations; it's at the same time rainy and dry, warm and cold. Soundscapes were the sounds presenting the most diverse environments, and the one category I did not try to classify by pitch, neither did they go through other types of processing than pure spatialization.

"The soundscape is any acoustic field of study. We may speak of a musical composition as a soundscape, or a radio program as a soundscape or an acoustic environment as a soundscape. We can isolate an acoustic environment as a field of study just as we can study the characteristics of a given landscape. However, it is less easy to formulate an exact impression of a soundscape than of a landscape. (...) A soundscape consists of events *heard* not objects *seen*."<sup>100</sup>

Some specific soundscapes trigger overall changes in the sound installation.

- Superball rolling in a sink bowl will turn everything off, except the *Jet whistle pheasant* group.
- The sound of an elevator will turn everything off, and make the Ravel percussion music more frequent.
- Civil defense sirens will trigger the *trombone contrabass drilling* group, and keep only the *Ammons text* and *morphing multiphonics*.
- The sound of stones dropped into water will be repeated with variable spatial perspectives. The installation will focus on the Ammons texts.

After a certain time, things go back to a default balance. All of these triggering mechanisms were involved in the self-composing sound installation *Landscape with figures I*. Delays made connections less obvious, competing triggers were at times able to neutralize each other. For *Landscape with figures II*, some of the secondary triggers were disconnected, as they made it difficult to control the development of the piece on cues.

It will not make sense to reproduce these spatial perspectives in stereo.

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<sup>96</sup> <http://www.soundfield.com/>

<sup>97</sup> <http://www.soundfield.com/products/plugins.php>

<sup>98</sup> <http://www.cockos.com/reaper/>

<sup>99</sup> <http://harpex.net/>

<sup>100</sup> Schafer, 1994, *The Soundscape, the Tuning of the World*, p. 7-8.

# Landscape with figures II

## Types of fragments

After creating the sound installation *Landscape with figures I* through numerous fragments to be played in any order or superposition, I tried to approach writing for voices and ensemble in a similar way, not as a large scale dramaturgy, rather a kaleidoscopic situation where fragments of different types and lengths can be performed in numerous possible orders. I made sets of variations of different ideas, without deciding a definite order until the very end of the process. We will look at characteristics of the various types of fragments.

The complete fragment structure of *Landscape with figures II* for 5 voices, 17 musicians and electronics follows. The sound installation elements unfold over more limited time spans than in *Landscape with figures I*. Variations of ideas were composed separately, then spread out like elements of a kaleidoscope, with attempts to find continuous contrasts of fragment type and involved ensemble constellations.

If omnidirectional continuity is impossible to represent in time,<sup>101</sup> a multitude of fragments can form windows into aspects of a vocabulary of continuity.

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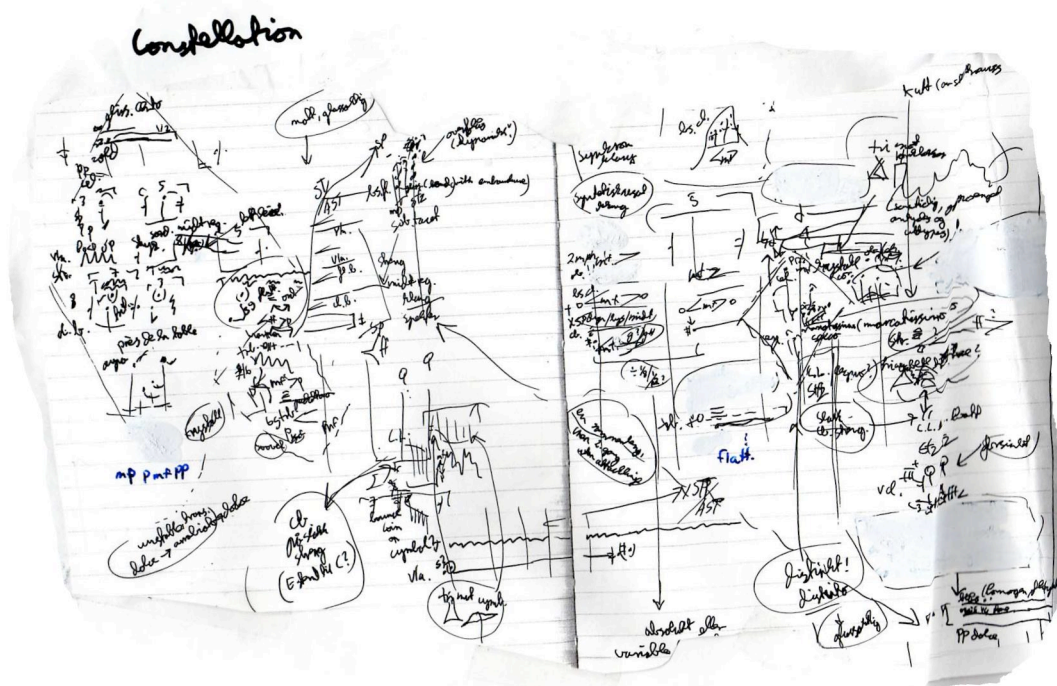
<sup>101</sup> "alles soll sich aus allem kontinuierlich entwickeln. (...) allseitige kontinuierlichkeit. die läßt sich aber in der zeit nicht darstellen. wenn du dir vorstellst, daß alle dimensionen zum beispiel des musikalischen sich gleichzeitig in alle richtungen verändern, dann ist schon bei dem parameter, der selber multidimensional ist, bei der klangfarbe, deren hauptindruck nach dem einschwingvorgang durch die zusammensetzung der lautstärkeverhältnisse der teiltonreihe entsteht, nicht kontinuierlich aus einer linear eine reihe von anderen zu entwickeln, ohne daß man mindestens kurven macht oder in die gegenrichtung geht: es geht also um das problem der multidimensionalen skalierung..." Mathias Spahlinger, "alles aus allem entwickeln", p. 23.

# Landscape with figures II [90']

- **SOUNDSCAPE**
  - AA Ensemble Fragment 1
  - AB Intermezzi Fragments 1-3
  - AC Tutti Fragment 1
  - AD String signals 1
  - AE Whispering room 9
- **SOUND INSTALLATION: Landscape with figures**
- AF Intermezzi Fragment 4 (within sound installation)
  - AG String Signals 8
  - AH Intermezzi Variation 6
  - **Repeated later!**
  - AI Vocal Gliss 1
  - AJ Ensemble text 1 **Repeated later!**
  - AK Tutti Fragment 2
  - AL Antiphonal Duos 1
  - AM Whispering room 1
  - AN Antiphonal Groups 1
  - AO Intermezzi Fragment 11
  - AP Intermezzi Fragment 7
- **SOUND INSTALLATION: Landscape with figures**
- AQ Intermezzi Fragment 15 (within sound installation)
  - AR Tutti Fragment 5
  - AS Vocal Gliss 3
  - AT Tutti Fragment 3
  - AU Intermezzi Fragment 5
  - **Repeated later!**
  - AV Intermezzi Fragment 14
  - **Repeated later!**
  - AW String signals 9
  - AX Intermezzi Variation 1
  - AY Whispering room 6
  - AZ Antiphonal Chamber Music 7
  - BA Intermezzi Variation 5
  - **Repeated later!**
  - BB Antiphonal Chamber Music 1
  - BC Noise Circles 1
- **SOUND INSTALLATION: Landscape with figures** (overlap with next)
  - BD String signals 6 (within sound installation)
  - BE Intermezzi Fragment 6
  - BF Tutti Fragment 7
  - BG Intermezzi Variation 9
  - BH String signals 5
  - AV Intermezzi Fragment 14
  - BI Ensemble text 2
  - BJ Intermezzi Fragment 9
  - BK Intermezzi Fragment 10
  - BL Antiphonal Chamber Music 2
  - BM Intermezzi Fragment 12
  - BN String signals 2
  - BO Vocal gliss 2
  - BP Whispering room 4
  - BQ Antiphonal Chamber Music 4
  - BR Intermezzi Variation 7
- **SOUND INSTALLATION: Landscape with figures**
- BS String signals 7 (within sound installation)
  - BU Intermezzi Variation 8
- **SOUND INSTALLATION: Landscape with figures**
- BV Intermezzi Fragment 8 (within sound installation)
  - BW Whispering room 8
  - BX Antiphonal Chamber Music 3
- **SOUND INSTALLATION: Landscape with figures** (overlap with previous and next)
  - BY Tutti Fragment 4
  - BZ Antiphonal groups 3
  - CA Intermezzi Variation 4
  - CB Whispering room 3
  - CC Noise Circles 2
  - CD Vocal Gliss 4
  - CE Intermezzi Variation 15
  - CF Antiphonal groups 5
  - BA Intermezzi Variation 5
- **SOUND INSTALLATION: Landscape with figures**
  - AJ Ensemble text 1
  - CG String signals 10
  - CH Tutti Fragment 6
  - AU Intermezzi Fragment 5
  - CI Intermezzi Variation 2
  - CJ Intermezzi Variation 3 (attacca from previous)
  - CK Ensemble Fragment 2
  - CL Antiphonal groups 2
  - CM Intermezzi Variation 14
- **SOUND INSTALLATION: Landscape with figures** (alarm and bass sounds more frequent)
- CO Intermezzi Fragment 13 (within sound installation)
  - CP Tutti Fragment 8
  - CQ Antiphonal duo 2
  - CR Antiphonal Chamber Music 5
  - CS Intermezzi Variation 11
  - CT Intermezzi Variation 12
  - CU Intermezzi Variation 13
  - CV String signals 4
- **SOUNDSCAPE**
- CW Intermezzi Variation 10 (within soundscape)
- **SOUND INSTALLATION: Landscape with figures**
- AH Intermezzi Variation 6 (within sound installation)
  - AV Intermezzi Fragment 14
  - CY Antiphonal Chamber Music 6
- **SOUNDSCAPE** (soft industrial track, overlap with next)
  - CZ String signals 3 (within soundscape)
  - DA Whispering room 7
  - DB Intermezzi Variation 16
  - DC Antiphonal Groups 4
- **SOUND INSTALLATION: Landscape with figures**
  - DD Intermezzi Fragment 16 (within sound installation)
  - DE Noise Circles 3
- **SOUNDSCAPE**

## Tutti fragment

In the initial project description,<sup>102</sup> I described sketches behind many of my works, especially when a large ensemble is involved. This is a sketch for a fragment of the work *Circles* (2006).



### CD Track 40: Circles extract.

Palettes of possible sounds are sketched out, while chronological sketches move through these terrains. Computer assisted methods were used for some detail textures, while outlines and timbres involved had usually been fully planned in advance. I had a large amount of these drawings, cutting and pasting them into a chronology. Some times they were copied, cut into tiny pieces, spread, pasted, turned upside down, to extend a musical situation over a longer period of time.

Initial sketches for the work to be Landscape with figures II were sketched out in similar ways.

<sup>102</sup> Ruben Sverre Gjertsen, 2011, Between instrument and everyday sound.

CD Track 41: AC Tutti fragment 1.

Handwritten musical notation and sketches on two pages of paper. The left page features a large, stylized sketch of a person's head and shoulders, possibly a portrait, with various musical notes and symbols around it. The right page contains several smaller sketches, including a person's head and shoulders, a person's torso, and a person's legs. The sketches are drawn with simple lines and include musical notes and symbols. The overall style is informal and expressive, suggesting a creative or experimental musical composition.

[illegible]

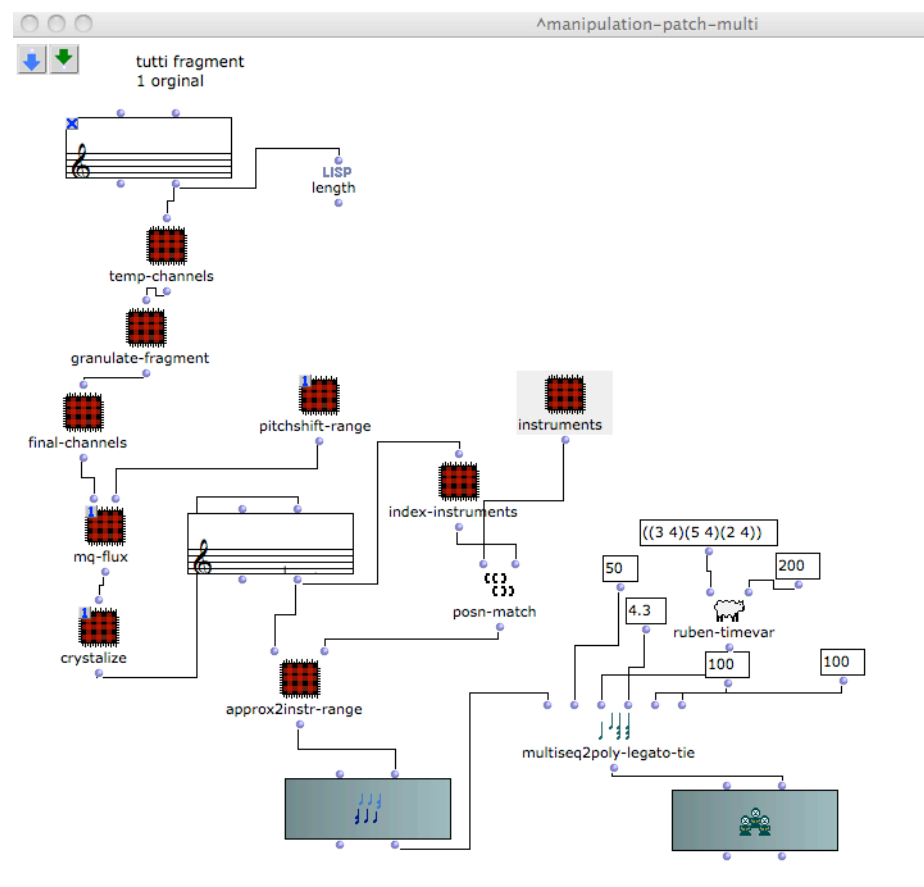


"Phrases have, until recently, pervaded *all* Western music, even multiply-directed and moment forms: phrases are the final remnant of linearity. But some new works show that phrase structure is not a necessary component of music. The result is a single present stretched out into an enormous duration, a potentially infinite "now" that nonetheless feels like an instant. In music without phrases, without temporal articulation, without total consistency, whatever structure is in the music exists between simultaneous layers of sound, not between successive gestures. Thus, I call the time sense involved by such music "vertical".<sup>106</sup>

This vertical time sense can form a parallel to vertical 'polymorphic' textures versus the linearity of 'polyphony'. Active gestures or melodic lines can at times be neutralized in a kaleidoscopic situation, potentials of linearity can be interrupted through short durations and placement into arbitrary contexts, and limitations posed by their existence within bubbles. A tam-tam strike cutting the ensemble off will nevertheless have a function, Helmut Lachenmann could call it 'Klang-kadenz'.<sup>107</sup>

The composed fragment go through similar methods as the *Ravel percussion* fragments, with additional steps to handle ranges of voices and instruments. Some of the functions have been shared in the public Ruben-OM library, some are more specific to my musical preferences.

- The input music has 22 parts.<sup>108</sup> These are given individual MIDI channel numbers, to keep them separate.



- The music is 'granulated',<sup>109</sup> fragments of variable lengths are extracted and superposed. The number of excerpts decide the density of the output fragment.
- Parts are already identified by MIDI channels. Through *channel-hocket-multiseq*, a large number of fragments are joined back into just 22 parts.

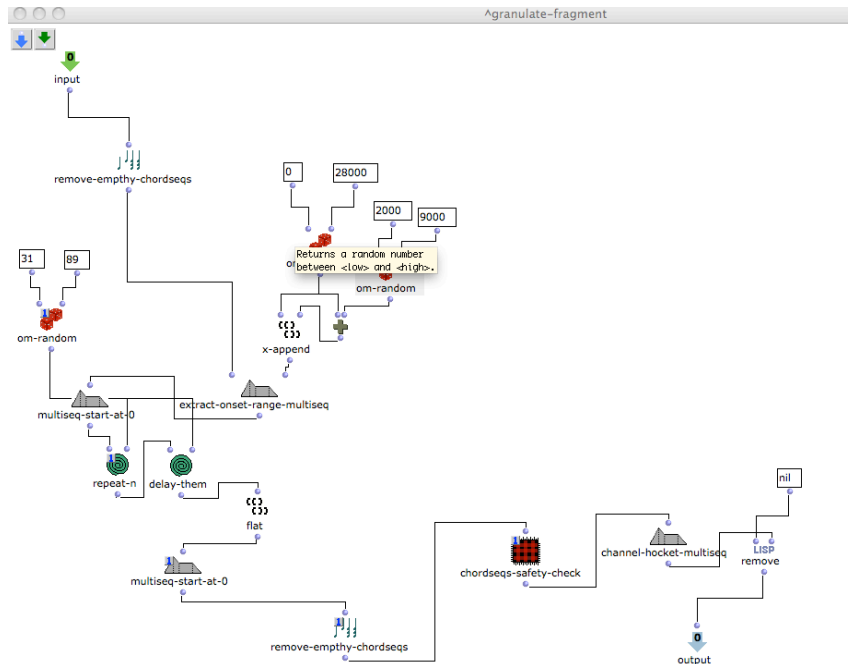
<sup>106</sup> Kramer, 1988, *The Time of Music*, p. 55.

<sup>107</sup> Lachenmann, 2004, *Musik als existentielle Erfahrung*, p. 3.

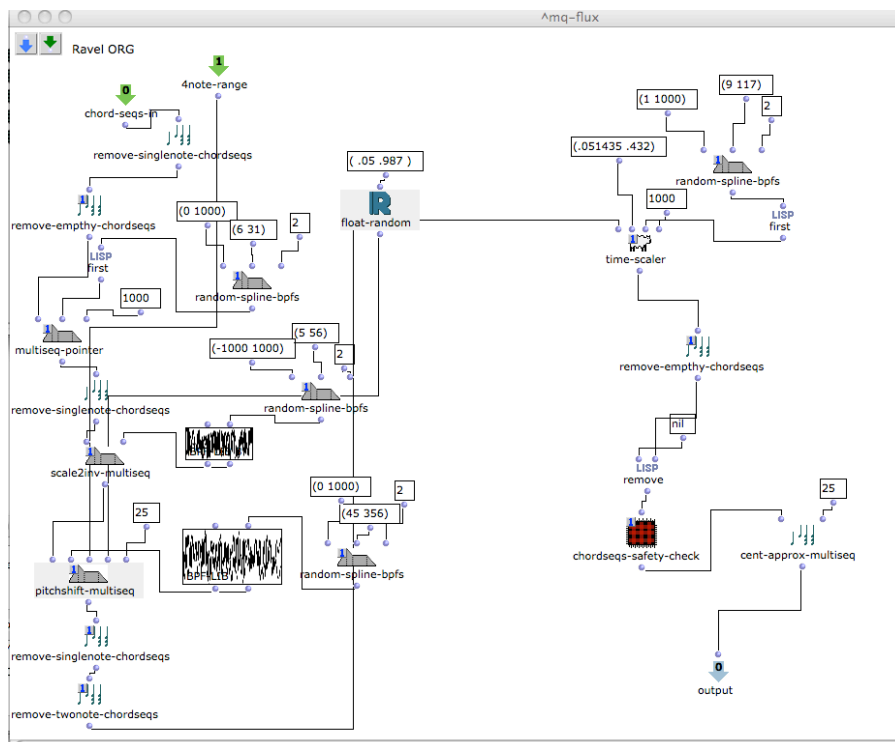
<sup>108</sup> Vertically, not understood as sections of the piece.

<sup>109</sup> The word can be transferred from extracting, superposing and reordering segments of a sound on a micro level, known as 'granular synthesis', to applying similar methods to fragments of a musical composition.

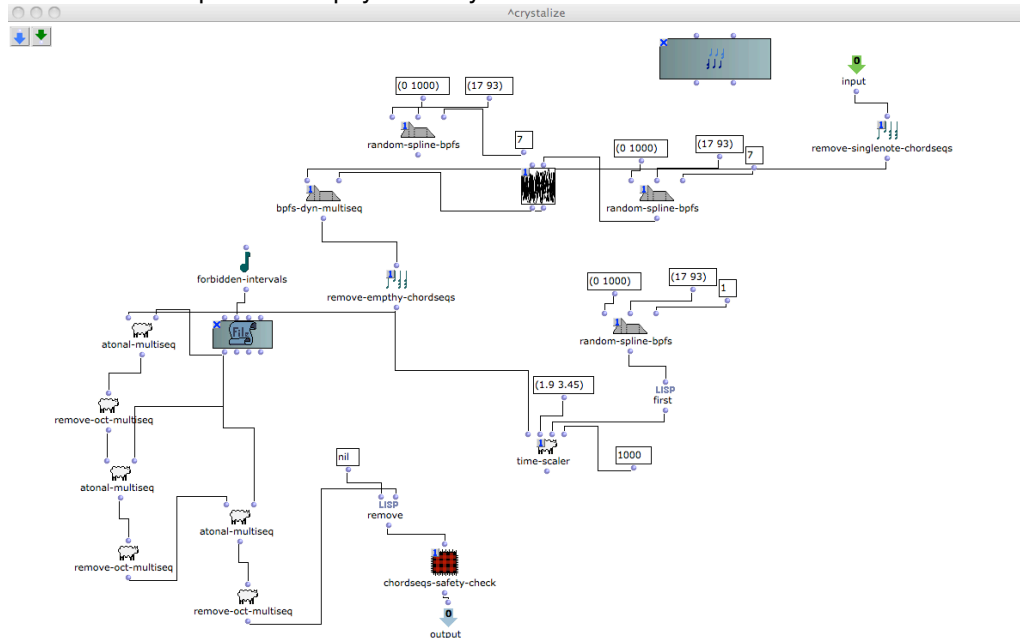




- The music goes through a set of manipulations through curve trajectories; a time pointer, scaling towards inversion, pitch shifting, time scaling, approximation to 1/8-tones. With smooth random curve trajectories, variations will be endless, not just confined to the four forms of Modus Quaternion.

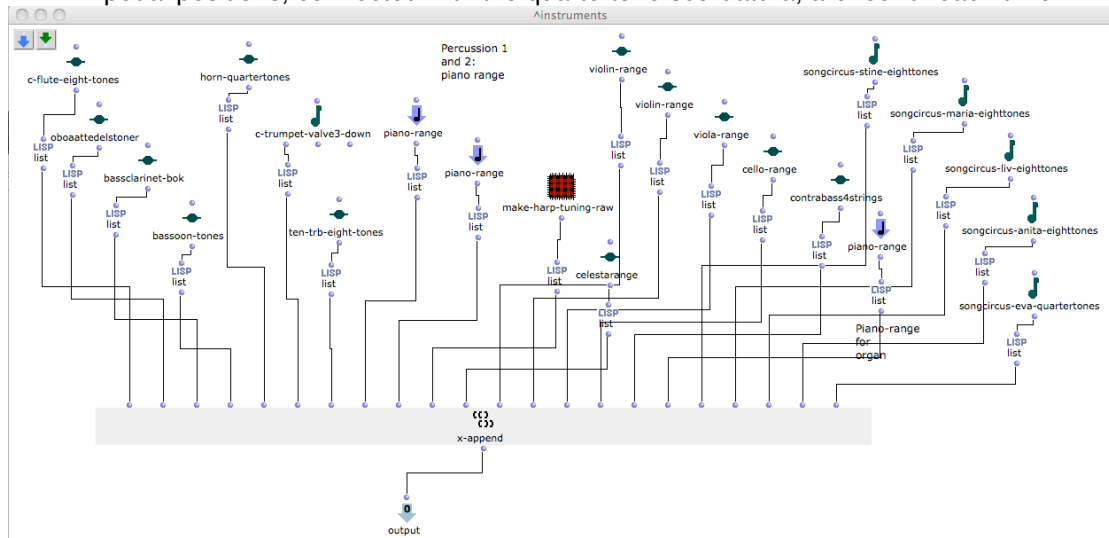


- Filters remove the last of 3 notes, if 2 intervals form a triad included in the "forbidden" list. Many of them are chords with strong tonal associations, or melodic patterns I found less satisfactory. The material is filtered several times by *atonal-multiseq*. I did not include this function or the list of forbidden in the public Open Music library, since it would be dogmatic to share these personal preferences. Programming is used to investigate principles in my mind while composing. Asbjørn Schaatun has described the computer as a "psychoanalyst".<sup>110</sup>

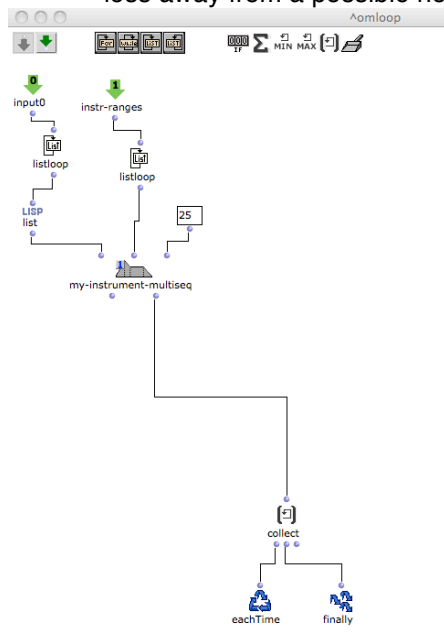


<sup>110</sup> Asbjørn Schaatun, 1989, The computer as a psychoanalyst, thoughts on computer-aided composition.

- The individual parts need to be limited to the available notes on the instrument. These lists of midicents are static, except for the harp, where new modes from particular pedal positions, connected with the quartertone scordatura, are found each time.



- Every part is tested for instrumental range: Let the note pass only if it's an 1/8-tone or less away from a possible note on the instrument.



This does not guarantee a playable results. Many fragments were completely unplayable, which led to creative translations and adaptations to the particular instruments. Composing can happen building structures from nothing, or filtering meaning out from a chaos. This could be compared to the distinction between additive and subtractive synthesis of sound.<sup>111</sup> Some times the computer distorted the materials, some times it made surprisingly clear ideas.

What I try to do in the final phases is making sense of this 'fractured world', interpret materials to available sounds on the instrument. I made more than 100 distorted tutti fragments and selected 7 versions with potential. BY Tutti Fragment 4 was one of them.

<sup>111</sup> In additive synthesis, timbres are built from sine waves. In subtractive synthesis, timbres are found through filtering of noise.

For comparison, this is the raw material for measure 6 of BY Tutti Fragment 4:



Certain notes or figures were often removed manually before the score was exported, clarifying relations of sound and silence, or economy of movement, finding focus from periods of "computer babbling". We can hear how the initial and unplayable raw materials sounded through a MIDI performance.

CD Track 42: BY Tutti Fragment 4 MIDI raw material.

This is how the same measure was freely and idiomatically interpreted.

-BY Tutti Fragment 4 -

The score is for a piece titled "-BY Tutti Fragment 4 -". It features a variety of instruments and vocalists, each with a unique interpretation of a single measure. The time signature is 7/4, and the key signature has one flat (B-flat). The instruments and vocalists listed on the left are: S1: Stine, S2: Maria, M: Liv, A1: Anita, A2: Eva, Fl., Oboe, Bass Cl., Bsn., Horn, C Tpt., Ten. Trb., Perc. I, Perc. II, Harp, Cel., Microtonal Organ, Vln. I, Vln. II, Vla., Vcl., Cb., and Electronics. The score includes various musical notations such as notes, rests, and dynamic markings (e.g., *mp*, *mf*, *pp*, *ppp*). Some parts include performance instructions like "normale", "oscil. lento", "slapt.", "M. ph.", "son fondus region IV", "biabiglando", "oscil. lento", "vibr. estremo", "2 Triangles", "Ratchet", "rapid permutations", "LET TIP OF BOW BOUNCE BETWEEN STRINGS", "LIGHT CIRCULAR BOW", "BOTTLENECK GLISS", "BOTTLENECK WIGGLE", "BOTTLENECK GLISS (L.B.)", "BOTTLENECK", and "pizz.". The score is divided into two systems, with the first system ending at measure 6 and the second system starting at measure 7. The final measure of the second system is marked with a 3/4 time signature.

- 3 -

CD Track 43: Final version of BY Tutti Fragment 4.

Many phrases and rhythms can be recognized. The textures have been thinned out, difficult string figures are replaced by bouncing and wiggling techniques. Vivid pitch figures can be brought to density of a sound phenomena rather than an exact reproduction of the raw materials.

The microtonal organ is tuned in the 'random pelog 39' tuning.<sup>112</sup> Sounding pitch will be very different from the notated pitch, as well as the raw materials. I did a lot of changes while testing the organ. When adapting the organ part in all fragments of this work, the first question was which tuning system and organ registers should be used for the fragment. These initial choices had huge consequences, turning raw materials into impulses to explore sonorities of microtonal tunings.

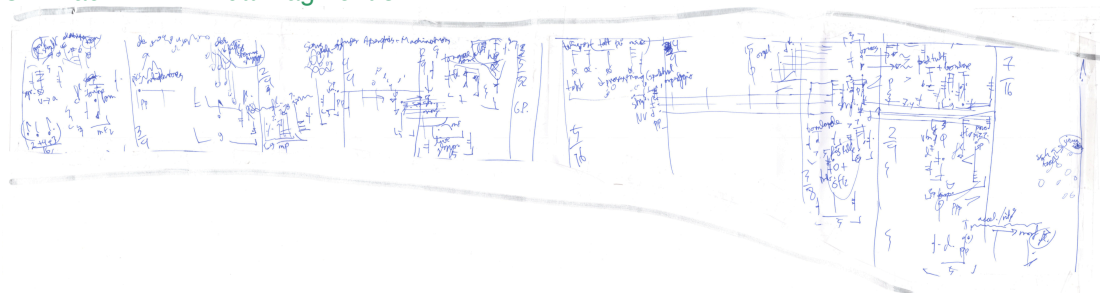
Tunings collide with the maximum 1/8-tone approximations of ensemble. I did not find this a problem in the performance, collisions of tunings are welcome within this sound aesthetics. There could be several reasons why I did not find it problematic.

- Microtones will not get purely equal tempered within an ensemble (except the celesta and tuned percussion). Microtonal fingerings on woodwinds are rather irregular, and not exact microtonal equal tempered scales.
- Multiphonics on woodwinds are difficult to define, pitch content can vary between instruments. These are irregular timbral phenomena.
- Unpitched percussion instruments or noise based performing techniques on other instruments bring sound into a domain where centered pitch doesn't have the primary focus. In one of his tables, Pierre Schaeffer suggests 7 degrees: 'son pur', 'son tonique', 'groupe tonique', 'cannelé', 'groupe nodal', 'son nodal', 'bruit blanc ou coloré'.<sup>113</sup> Unpitched percussion instruments come closer to the 'nodal' categories, while woodwind multiphonics can be seen as 'groupe tonique' of identifiable microtonal pitches.
- A collision of intonation will create beating effects. I have deliberately been looking for beatings through parallel concert pitches on the microtonal organ, or through dense tunings used for the sound installation fragments.

Kjell Tore Innervik's quartertone glockenspiel<sup>114</sup> operates in equal tempered quartertones. Intonation differences were not a problem, but contributed to a multitude of sonorities.

Ensemble fragment 5 was intuitively sketched and composed, but not used for further processing.

#### CD Track 44: AR Tutti fragment 5.



<sup>112</sup> Available in the 3 Manual Microtonal Organ: <http://www.bek.no/~ruben/Research/Downloads/software.html>  
Interval reservoir for random pelog tunings is shown in the organ documentation.

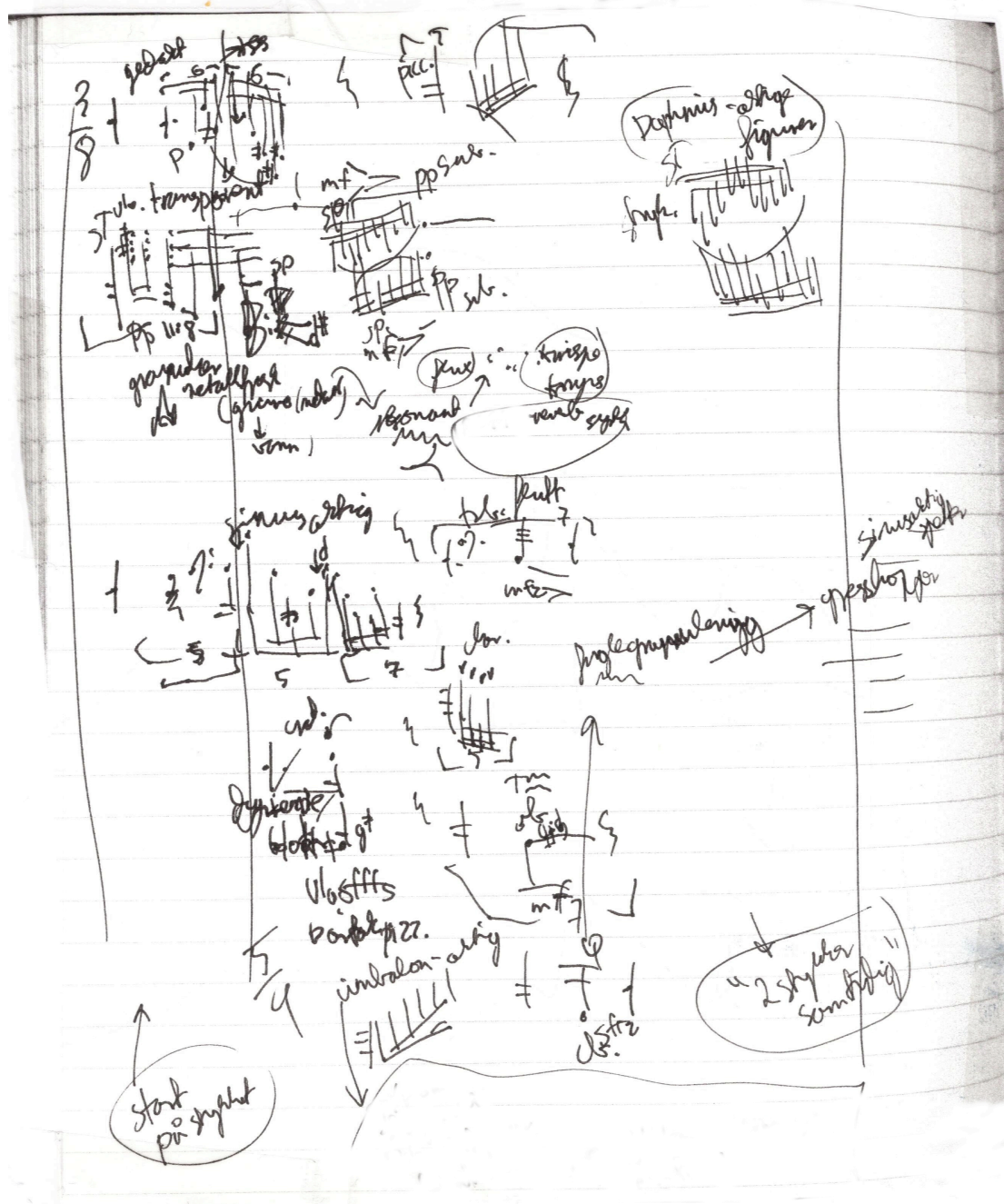
<sup>113</sup> Schaeffer, 1966, *Traité des objets musicaux*, essai interdisciplinaires, p. 518.

<sup>114</sup> <http://www.innervik.no/>

## Ensemble fragment

Ensemble fragment 1 was sketched early on and thought as a possible beginning of the work, a condensed sculpture exposing many timbral and gestural qualities to come.

CD Track 45: AA Ensemble fragment1



The sketch suggested a quotation from Ravel's *Daphnis et Chloe*. The flute figures in the first measure of *Lever du Jour* are arpeggiations on a D9 chord.

Helmut Lachenmann used textures of *Lever du jour* as an example of 'Fluktuationsklang'.<sup>115</sup>

"Die Wirkung bleibt dabei nach wie vor diejenige eines Zustandes; seine charakteristische Eigenzeit kommt zwar zur Geltung, hat aber mit der effektiven Dauer des Klanges selbst nichts mehr zu tun."<sup>116</sup>

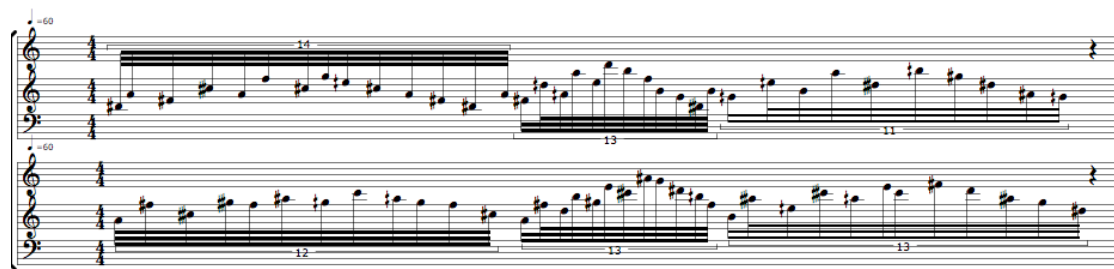
Salvatore Sciarrino shows this score side by side with stair patterns of the ancient bath in Vijayanagara, as examples of figural archetypes.

"However, when I hear that this is a descriptive piece, I have to laugh. But can you imagine a stream that swells like the ocean? Rather, its enormous waves are modeled on the passion of the protagonists who find themselves."<sup>117</sup>

A shorter excerpt could isolate the texture as a 'sound object' to be distorted.



Parts were pitch shifted and time scaled in four different versions. Pitch shifting inverted the melodic directions and introduced microtonal distortions. A slight difference of time scaling introduced polyrhythms instead of rhythmic synchronization. This transformation could be considered a type of 'morphing' of music.



<sup>115</sup> During his seminar at the Music Factory festival in Bergen, 2002.

<sup>116</sup> Lachenmann, 2004, *Musik als existentielle Erfahrung*, p. 10.

<sup>117</sup> "Tuttavia, quando sento dire che questo è un brano descrittivo, mi viene da ridere. Ma vi immaginate un ruscello che si gonfia come il mare? Piuttosto le sue onde spropositate sono modellate sulla passione dei protagonisti che si ritrovano." Sciarrino, 1998, *Le figure della musica da Beethoven a oggi*, p. 56.





#### CD Track 46: RavelDaphnisPitchshift.aif

I chose the fourth version, performed by violins in the last measure before the grasshopper fermata take over. The viola is vaguely paraphrasing Ravel's original bass line through tremolo and glissando.

## Ensemble text

*Finnegans wake* by James Joyce introduced frequent hybrid words and ambiguities of language. In *Landscape with figures II*, this novel was used as a huge reservoir of texts. The *Ensemble text* fragments draw sounds from a passage with musical descriptions. The pathos implied by the text is contradicted by the music, through whispering, brushed Tam-tams, and a soundfield recording of ventilation sounds.<sup>118</sup> Whispering through the instruments distort the text, especially through the narrow embouchure of a contrabassoon.<sup>119</sup>

#### CD Track 47: AJ Ensemble text 1.

Ensemble text 2 uses the same text. Instead of being spoken, the text is being "written" with sticks over the surfaces of percussion instruments.<sup>120</sup> The text has been translated to gesture, through the action of writing.

#### CD Track 48: Ensemble text 2, Huddersfield.

<sup>118</sup> Recorded in the hallways of Rokkans Hus, Bergen.

<sup>119</sup> Speaking through the instrument has been used in works by Helmut Lachenmann, for instance *Accanto* for clarinet and orchestra. <http://www.breitkopf.com>

<sup>120</sup> The technique of "writing" on a tam-tam has been used by Klaus Huber.

# AJ Ensemble text 1

**4/4** **♩=60** 15 repeats [or 60"]

WHISPER FREELY SELECTED PARTS OF JOYCE TEXT BELOW THROUGH INSTRUMENT  
Do not synchronize with beat patterns. The text doesn't need to be understood, it will create instrumental gestures.

**Bass Flute** *mf*

**Bass Clarinet** *mf*

**Contrabassoon** *mf*

**Horn in F** *mf*

**Trumpet in C** *mf*

**Tenor Trombone** *mf*

**Percussion I** *pp* static  
Tam-tam medio brushing motion Circulate slowly on Tam-tam to vary timbres, do not synchronize this with beat patterns.

**Percussion II** *pp* static  
Tam-tam grande brushing motion Circulate slowly on Tam-tam to vary timbres, do not synchronize this with beat patterns.

**Electronics**

We now romp through a period of pure lyricism of shame-bred music (technologically, let me say, the appetising entry of this subject on a fool chest of vials is plumply pudding the carp before doevre hors) evidenced by such words in distress as *I cream for thee, Sweet Margareen*, and the more hopeful *O Margareena! O Margareena! Still in the bowl is left a lump of gold!* (Correspondents, by the way, will keep on asking me what is the correct garnish to serve drisheens with. Tansy Sauce. Enough). The pawnbreaking pathos of the first of these shoddy pieces reveals it as a Caseous effort. Burrus's bit is often used for a toast. Criniculture can tell us very precisely indeed how and why this particular streak of yellow silver first appeared on (not in) the bowel, that is to see, the human head, bald, black, bronze, brown, brindled, betteraved or blanchemanged where it might be usefully compared with an earwig on a fullbottom. I am offering this to Signorina Cuticura and I intend to take it up and bring it under the nosetice of Herr Harlene by way of diverting his attentions. Of course the unskilled singer continues to pervert our wiser ears by subordinating the space-element, that is to sing, the *aria*, to the time-factor, which ought to be killed, *ill tempor*. I should advise any unborn singer who may still be among my heeders to forget her temporal diaphragm at home

(the best thing that could happen to it!) and attack the roulade with a swift *colpo di glottide* to the lug (though Maace I will insist was reclined from overdoing this, his recovery often being slow) and then, O! on the third dead beat, O! to cluse her eyes and aiopen her oath and see what spice I may send her. How? Cease thee, cantatrickee! I fain would be solo. Arouse thee, my valour! And save for e'er my true Bdur!

James Joyce, *Finnegans Wake*, Penguin Books (1992), P. 164-165.

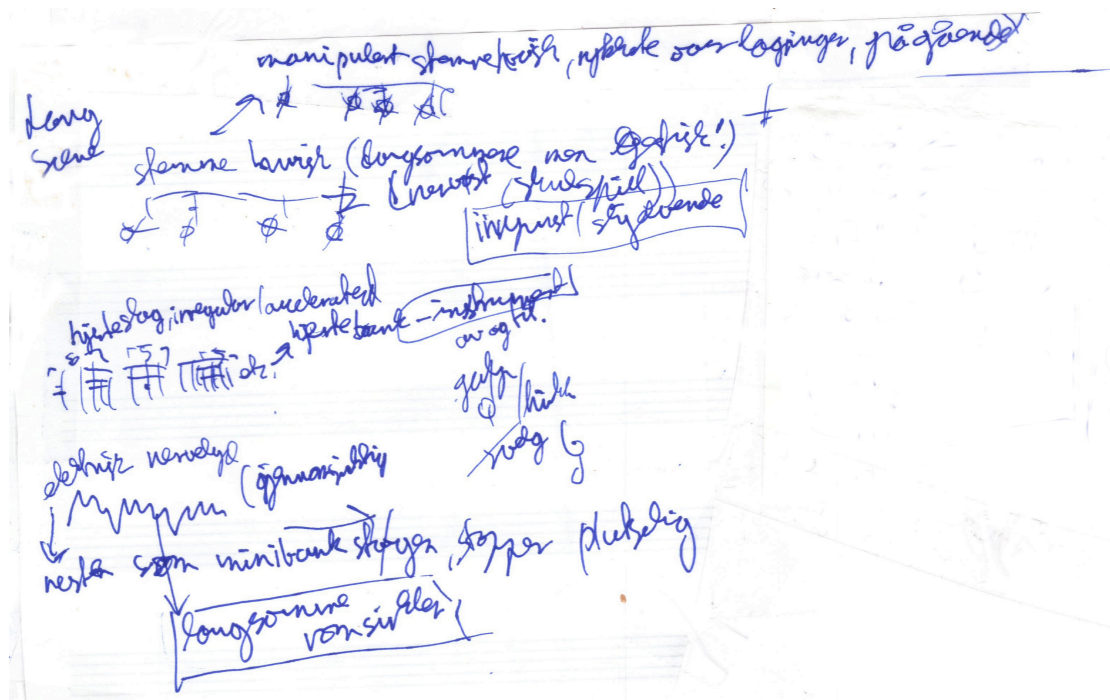
## Whispering room

John Cage visited an anechoic chamber and noted that in a room without sound, sounds of the body become very clear.

"There is no such thing as an empty space or an empty time. (...) For certain engineering purposes, it is desirable to have as silent a situation as possible. Such a room is called an anechoic chamber, its six walls made of special material, a room without echoes. I entered one at Harvard University several years ago and heard two sounds, one high and one low. When I described them to the engineer in charge, he informed me that the high one was my nervous system in operation, the low one my blood in circulation. Until I die there will be sounds. And they will continue following my death. One need not fear about the future of music."<sup>121</sup>

I early sketched situations which could form contrasts to the writing for full ensemble. A shadow situation could arise with whispering voices and electric tinnitus sounds. I made references to Gerard Grisey's work *Jour, contre-jour* (1978),<sup>122</sup> opening like a high tinnitus and deeper rumbling sounds, against occasional irregular heart beats and breaths.

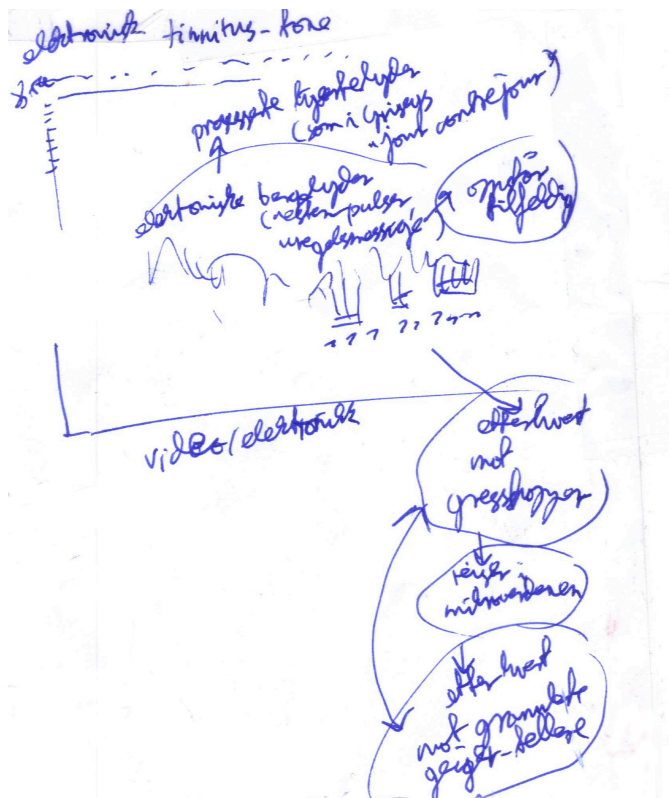
Voices should be whispering, slowly or rapidly, with nervousness and interruptions. The singers could whisper extremely fast, and recorded whisperings could move to even more extreme speeds, into a suggested 'buzz of voices'.<sup>123</sup> Associations move towards grasshoppers already present in the sound installation fragments.



<sup>121</sup> Cage, 1973, *Silence*, Lectures and writings by John Cage, p. 8.

<sup>122</sup> <http://www.ricordi.it/catalogue/products/jour-contre-jour/>

<sup>123</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*, p. 5.



One idea was to take the Cage situation literally and record sounds of a body in an anechoic chamber, though I ended up creating these whispering rooms by other means.

The sketches suggest sound phenomena which are difficult to notate, in transitional zones between the whispering voices and their digital transformations. Musical notation was set out to be an important tool for the project,<sup>124</sup> though not necessarily the only tool. I decided to open these parts for whispering improvisations over extracts from *Finnegans wake*. The whispering voices can be manipulated in a multitude of ways approaching the imagined electric, nervous, bodily or artificial sounds.

Pages of the Joyce texts were recorded in studio by Song Circus,<sup>125</sup> in 3 versions:

- Whispered and clearly audible text.
- Extremely rapid whispered text.
- The texts are used as a source for improvisation. Several parameters can be out of sync with the text:
  - Dynamic shapes.
  - Inhaled and exhaled breath gestures.
  - Hand tremolos in front of the mouth can obstruct the text.

#### CD Track 49: Eva Bjerga Haugen improvising on *Finnegans wake*.

More than 100 fragments were made for the whispering rooms. While making these 100 versions, registers and synthesis methods were varied. These are some of the versions:

- All whispering recordings are spectrally transposed,<sup>126</sup> blurred<sup>127</sup> or arpeggiated,<sup>128</sup> and generally speeded up. Through this some of the nervous qualities suggested by the sketches were achieved.

#### CD Track 50: Joyce text 2.

<sup>124</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*, p. 4.

<sup>125</sup> <http://songcircus.no/>

<sup>126</sup> pvscale in Csound: <http://www.csounds.com/manual/html/pvscale.html>

<sup>127</sup> pvsblur in Csound: <http://www.csounds.com/manual/html/pvsblur.html>

<sup>128</sup> pvsarp in Csound: <http://www.csounds.com/manual/html/pvsarp.html>

- All whispering recordings are either transposed or pitch shifted,<sup>129</sup> speeds vary from original speed to very rapid. Spectral pitch shiftings add new qualities to the sounds; components of the spectrum are not moved in proper overtone proportions like in transposition, making the sounds more artificial. Resonance frequencies and percussive attacks arise. In low registers shifted whispers sound like bouncing ping pong balls, in high register brilliant sounds appear.

CD Track 51: Joyce text 12.

CD Track 52: Joyce text 14.

CD Track 53: Joyce text 16.

- Recordings are transposed and pitch shifted, all played at rapid speeds. This comes closer to ideas in the sketches. The live singers do what is physically possible, and the manipulated version bring the whispering to impossible speeds.

CD Track 54: Joyce text 43.

- Whisperings are morphed<sup>130</sup> towards grasshopper and tam-tam sounds. The sounds are more artificial and electric sounding from the FFT distortions. This approached some of the electric nervous system sounds imagined in the sketches.

CD Track 55: Joyce text 61.

CD Track 56: Joyce text 74.

CD Track 57: Joyce text 79.

CD Track 58: Joyce text 80.

- Recordings are only pitch shifted in the highest registers. After a while I found these sounds interesting.

CD Track 59: Joyce text 146.

Making 100 versions of an idea gives a possibility to experience variations in how the processing affect sounds, and gradually guide the results towards more precise textures. This is quite similar to practising an instrument.

The fragments of processed sounds randomly are triggered in a sound installation situation.

Categories of fragments were:

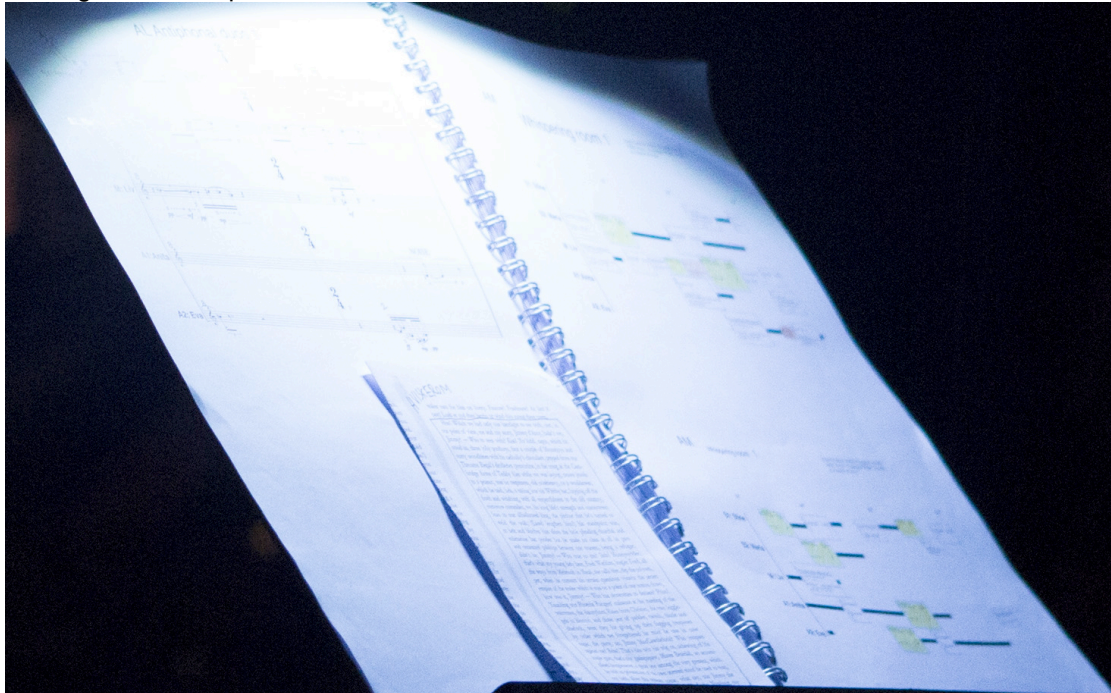
- The new Joyce text fragments.
- Existing fragment types from the Landscape with figures I sound installation:
  - Breaking.
  - Distorted breaking.
  - Ammons water.

<sup>129</sup> *pvshift* in Csound: <http://www.csound.com/manual/html/pvshift.html>

<sup>130</sup> The Csound opcodes *pvcross*, *pvmix* and *pvsfilter*.



The score suggested degrees of clarity, distortion or improvisation of the text. Song Circus chose to distribute ideas differently between the singers. Pages from *Finnegans wake* were held against the improvisation scores.



Detail of photo by Henrik Beck.

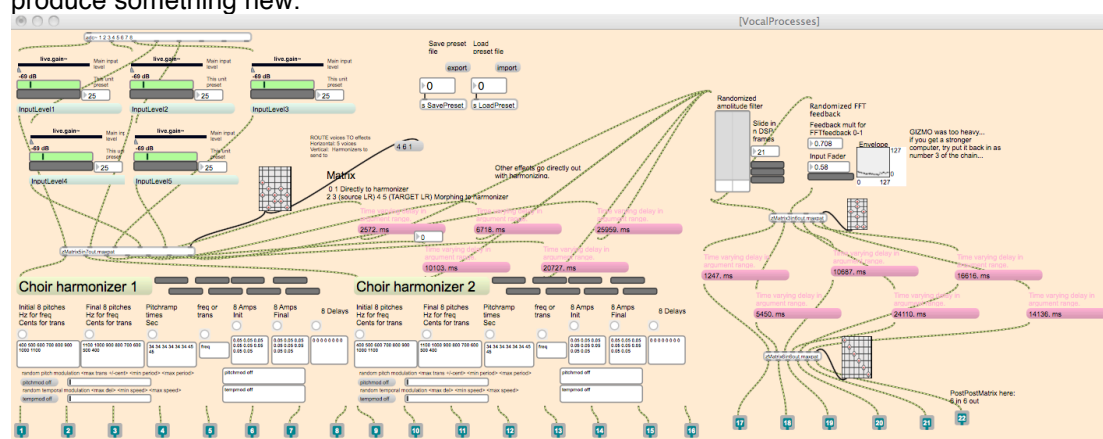
CD Track 60: AE Whispering room 9

The live whispering voices went through additional live processing through MaxMsp:

- 5 voices are routed to 5 different time variable delays, at random walks varying between 1.2 and 27 seconds.
- A FFT amplitude filter lets through the loudest frequencies . Filtering vary by random walks. Only sounds with high energy are passed. Synthesis parameters are randomly changed at random time intervals. This varies degree of distortion of the inputs. The result passes to final delays and moves through further processes.
- The filtered sound goes through an FFT feedback process where settings are in random walks. This added more electric and metallic sound qualities.
- Results of the filtering and feedback was supposed to go through an additional variable high frequency FFT pitch shifting.<sup>131</sup> The result could well create the imagined tinnitus sounds of the initial sketches. I had to skip this last step, as I was reaching a CPU limit through all processing, sound playback and spatialization involved. The highest priority should be stability throughout the performance.
- The results are routed through 6 more time variable delays, at random walks between 1.2 and 27 seconds.

Routings through these processings are done by matrixes, in different patterns for each *Whispering room* fragment. Variable routings, variable delays, filtering with variable degree of response and sine wave distortion, all contribute to unpredictable and continous high frequency textures from the whispering singers.

The whispering room sketches are principles rather than fixed materials, through improvisations and unpredictable processing. Results can approach the initial ideas or produce something new.



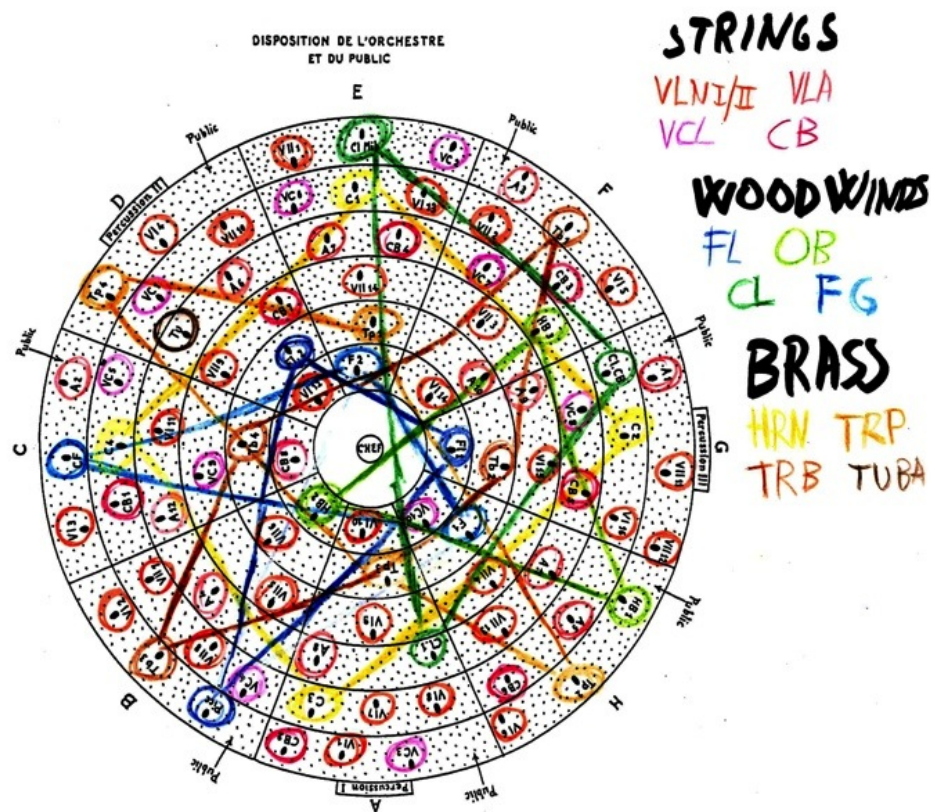
<sup>131</sup> The MaxMsp gizmo~ object.

## The antiphonal fragments

A central interest in the project was finding spatial distributions and perspective both through diffusion of electroacoustic sound and by how musicians are seated.

"The venetian renaissance music spread vocal groups at the different galleries of San Marco. Karlheinz Stockhausen followed up this idea in *Gruppen* (1957) for 3 orchestral groups. Iannis Xenakis atomized the orchestra completely in *Nomos Gamma* (1968) by spreading the musicians amongst the audience."<sup>132</sup>

In search for spatializations within instrumental music, the atomizing approach in *Nomos Gamma* and *Terretektorh* by Xenakis struck me as the most relevant for my ideas. If we add colours to the seating plan for *Terretektorh*,<sup>133</sup> it is clear how each timbre type is spread as far as possible around the audience. There are triangles of flutes, oboes, clarinets, bassoons, and squares of horns, trumpets and trombones. The strings form more continuous spatial constellations, and when all musicians play the same percussion instruments, there are no timbral differences, just space.



"*Terretektorh* is thus a "Sonotron": an accelerator of sonorous particles, a disintegrator of sonorous masses, a synthesizer. It puts the sound and the music all around the listener and close up to him. It tears down the psychological and auditive curtain that separates him from the players when positioned far off the pedestal, itself frequently enough placed inside a box. The orchestral musician rediscovers his responsibility as an artist, as an individual."<sup>134</sup>

Sketches drawn by Xenakis suggest architectural spatialization trajectories for woodwinds, between sector A to H of the orchestral setup.<sup>135</sup> A final sawtooth shape give 2 full rotations through the hall.<sup>136</sup>

<sup>132</sup> Ruben Sverre Gjertsen, 2011, *Between instrument and everyday sound*, p. 4.

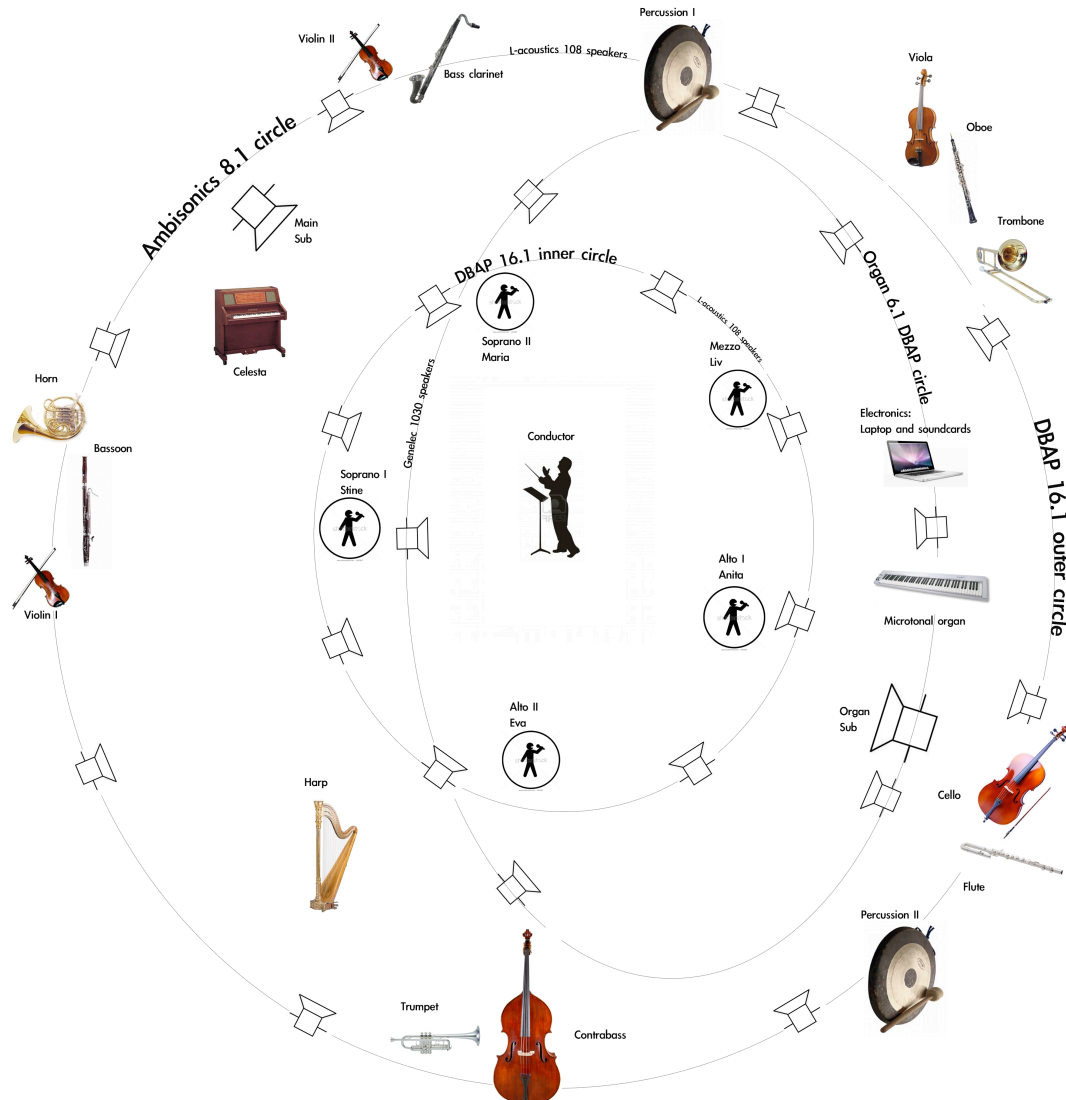
<sup>133</sup> <http://www.durand-salabert-eschig.com/>

<sup>134</sup> Xenakis, 1992, *Formalized Music* [translated from french edition (1955-65)], p. 237.

<sup>135</sup> Maria Anna Harley, 1994, *Space and Spatialization in Contemporary Music: History and Analysis, Ideas...*, p. 289.



A vocal ensemble of 5 singers and an instrumental ensemble of 17 musicians, offer less possibilities for such an equal distribution of timbres. The seating for *Landscape with figures II* is nevertheless strongly inspired by the Xenakis idea. There is a triangle of brass instruments, a square of heterogenous woodwinds. 5 voices and 5 strings offer the most complete circles. Like for the speaker setup, they form a divide between inner and outer circle.



*Antiphonal fragments* and *Noice circles* are parts of the work where the spatial positions and spatial trajectories are used directly as compositional techniques. The *ensemble-circles* methods<sup>137</sup> proved useful to create circular flux through the setup, through architectural methods related to those used by Xenakis. What fills the musical surface levels is a different story.

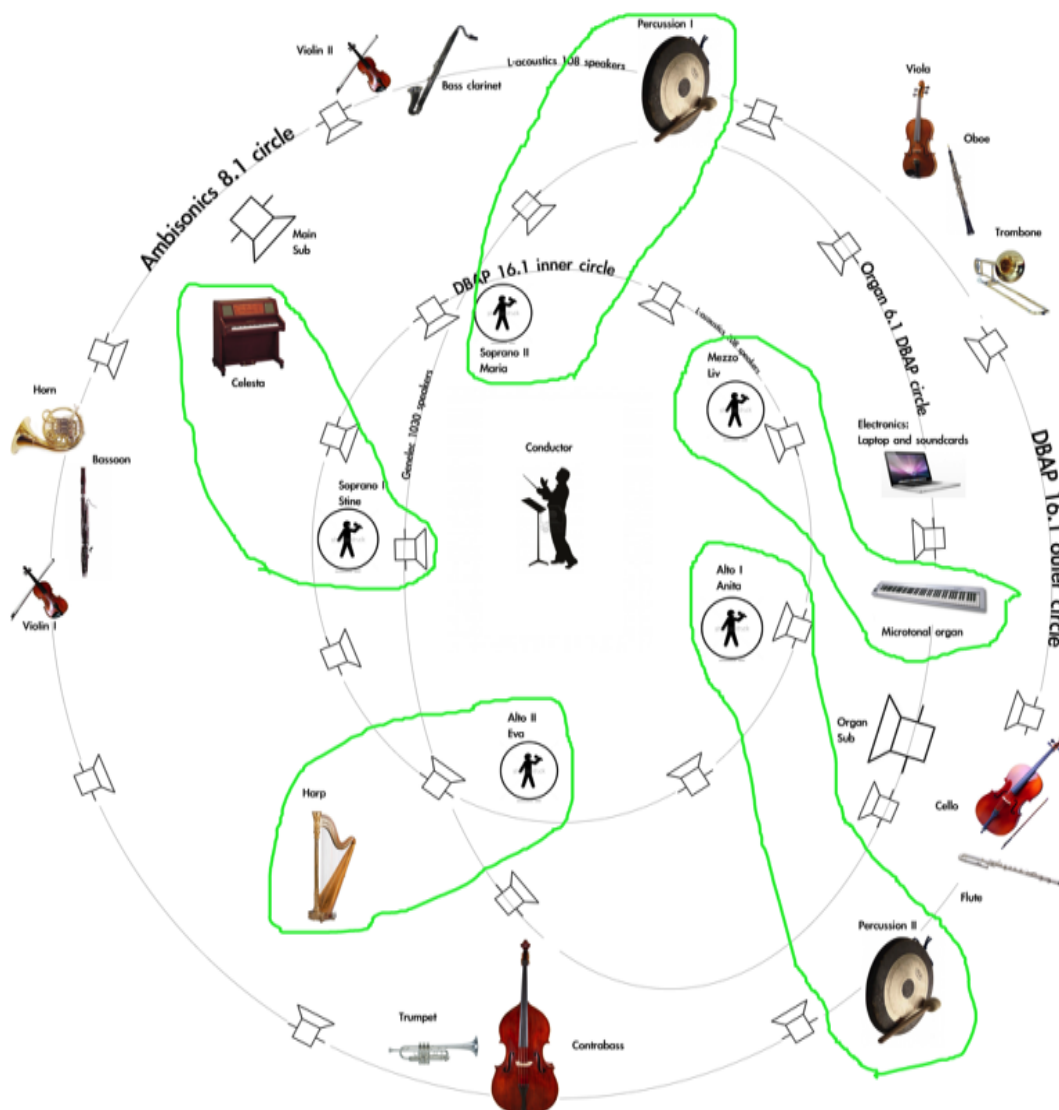
<sup>136</sup> <http://www.moonrisepress.com/dissertation.html>

<sup>137</sup> Ruben-OM: *ensemble-circles, ensemble-circles-lists, ensemble-circles-lists-gliss.*

## Antiphonal duos

The ensemble setup works like a map for the antiphonal fragments. Through *Antiphonal duos*, each singer is accompanied by a nearby musician. 5 duos have fixed roles:

- Static, frozen blocks with the very high soprano Stine Motland and celesta.
- Overtone or nasal singing with almglocken.
- Quartertone melodies in a narrow range. Liv Runesdatter's background from folk music give the material a context, through vocal colour, intonation and ornaments. The microtonal organ is some times sustained through the irregular circular attack cycles of the groups. The 'Expansion of Grains tuning'<sup>138</sup> contain intervals of overtone ratios where every octave is a new world to explore. These variable intervals can well coexist with a folk music vocal expression, while exactly doubling pitches from the organ proved less realistic.
- Noisy multiphonic or subharmonic voice sounds are accompanied by noises of a tam-tam.
- Quartertone melodies in large range are accompanied by harp arpeggios. Eva Bjerga Haugen's jazz background give entrances a transparent colour.



<sup>138</sup> Ruben Sverre Gjertsen, 2013, 3 Manual Microtonal Organ, p. 15.

# CQ Antiphonal duos 2

The musical score is divided into two main time signature sections: 3/4 and 2/4. The tempo is marked as  $\text{♩} = 40$ .

**3/4 Section:**

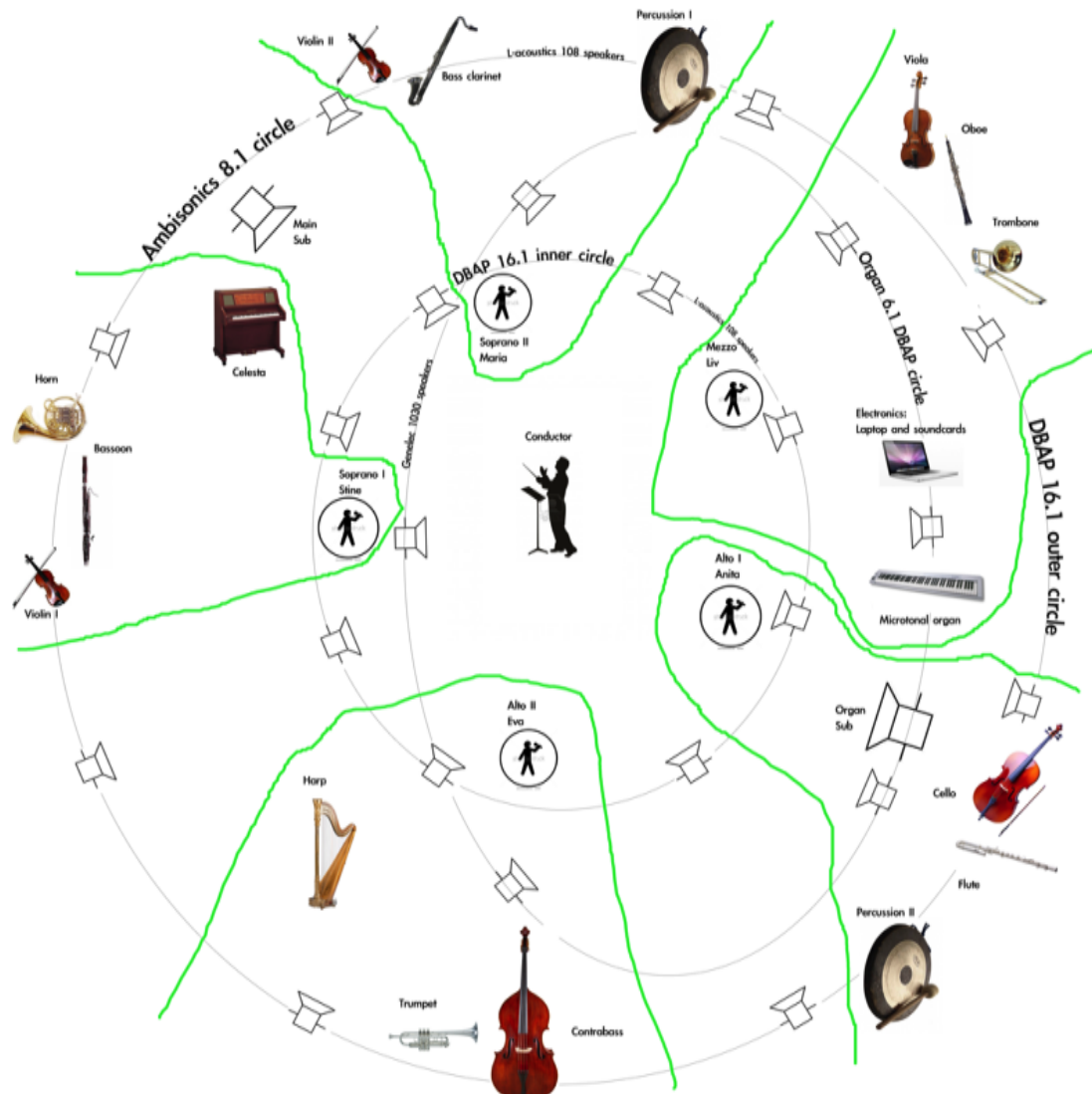
- S1: Stine:** Vocal line with lyrics "NV sempre".
- Celesta:** Accompanying instrument.
- S2: Maria:** Vocal line with lyrics "NASAL".
- Quartertone Glockenspiel:** Accompanying instrument.
- Percussion I:** Includes "Almglocken" with a tremolo ad lib. on long notes.
- M: Liv:** Vocal line with lyrics "Raw timbre Like a cattle call".
- Microtonal Organ:** Accompanying instrument with notes labeled "II".

**2/4 Section:**

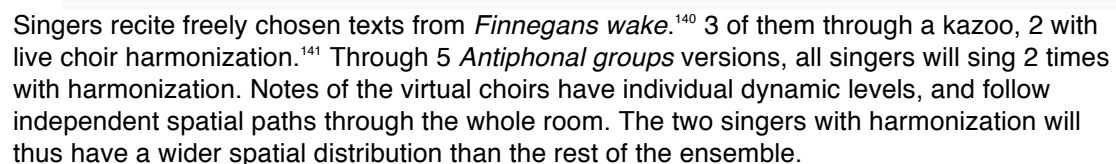
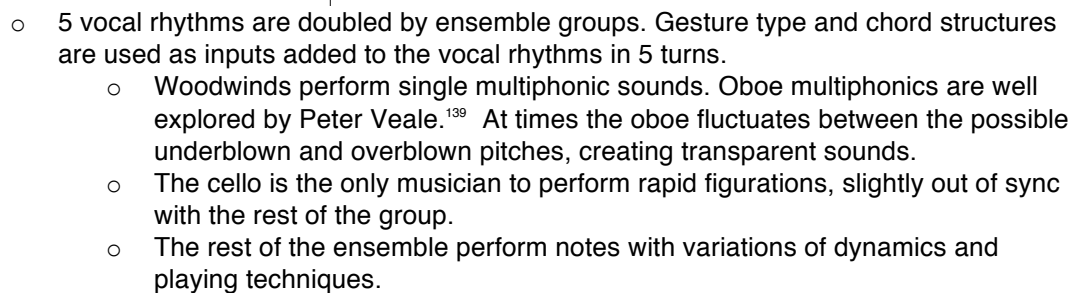
- A1: Anita:** Vocal line with lyrics "NOISE NOISE".
- Percussion II:** Includes "Tam-tams" with a legend:  $\square$  brushes / tam-tam beater / triangle sticks strike/brush/scrape improvisando al fine.
- A2: Eva:** Vocal line with lyrics "continuous arpeggio rapido improvisando".
- Harp:** Accompanying instrument with notes labeled "D C Bb / E F G A#".

## Antiphonal groups

The *Antiphonal groups* fragments are composed of cycles between polychoral blocks. A singer is still central for every group.



- An irregular sawtooth curve with up to 4 full rotations through the room trigger entrances for the 5 singers. Moderate curves create audible spatial paths, while steep curves blur spatial positions into an overall polyphony.



<sup>141</sup> Ircam's psychoirtrist~ object for MaxMsp.

Chords are ad hoc just intonation transpositions from sung pitch. To clarify this non standard approach, we will look at the choir harmonization for all 5 fragments.

## AN Antiphonal groups 1

### Stine

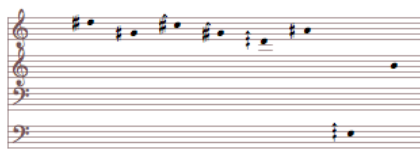
A sung pitch is used as an input.



All the following ratios are multiplied by the frequency of the vocal pitch.

(3/2 32/33 15/11 67/66 5/7 13/12 2/79 13/45)

A resulting chord can be approximated to notation. The harmonization will still use the more precise overtone transpositions. Pitches will move in parallel with the voices in these fragments.<sup>142</sup>



### Eva

A sung pitch.



Ratios multiplying the frequency.

(33/34 11/20 9/8 13/56 67/32 3/2 17/22 17/8)

Approximate chord notation.



## CL Antiphonal groups 2

### Liv

A sung pitch.



Ratios start from the sung pitch, the following notes are all calculated from previous note.

(67/66 10/9 34/35 8/7 2/3 11/10 127/32 25/37)

Resulting pitches are different from when all pitches are multiplied just from the initial note. Overtone relations can grow more distant.



<sup>142</sup> It is also possible to define static harmonizer frequencies for psychoirtrist~.

### Anita

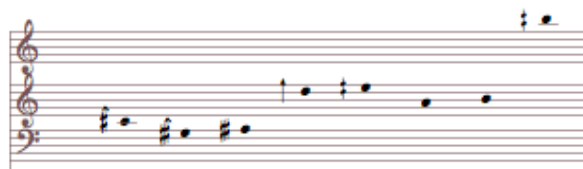
A sung pitch.



Ratios start from the sung pitch, the following notes are all calculated from previous note.

(13/12 7/9 11/10 5/2 35/31 19/29 9/8 65/8)

The approximate chord.



### BZ Antiphonal groups 3

#### Maria

A sung pitch.



Ratios start from the sung pitch, the following notes are all calculated from previous note.

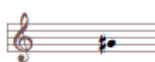
(7/6 10/11 4/7 27/7 2/3 2/3 11/16 9/8)

The approximate chord.



#### Liv

A sung pitch.



Ratios start from the sung pitch, the following notes are all calculated from previous note.

(2/3 13/19 67/8 67/66 4/9 125/223 25/26 7/5)

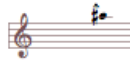
The approximate chord.



#### DC Antiphonal groups 4

##### Stine

A sung pitch.



Ratios multiplying initial the frequency.

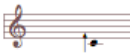
(33/32 8/9 41/13 29/17 67/66 13/68 3/2 6/14)

The approximate chord.



##### Anita

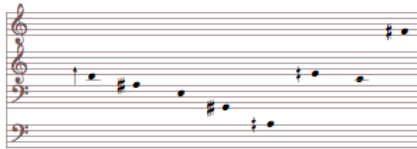
A sung pitch.



Ratios multiplying initial the frequency.

(9/8 10/11 5/8 32/80 6/28 41/32 65/66 39/7 )

The approximate chord.



#### CF Antiphonal groups 5

##### Maria

A sung pitch.



Ratios multiplying initial the frequency.

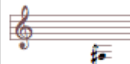
(67/66 10/11 67/32 3/2 89/11 67/35 47/17 64/35)

The approximate chord.



##### Eva

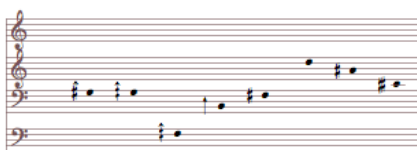
A sung pitch.



Ratios multiplying initial the frequency.

(9/8 13/12 8/33 2/3 65/66 97/31 35/14 49/32 )

The approximate chord.





All these harmonizations by overtone ratios can create resonant chords. If transpositions were equal tempered, we would hear notes separately. Fine nuances of intonation can make chords blend into a single homogenous sounds. Sonorities reach vagueness of sound quality as overtone relations grow more distant than for a spectrum over a deep unambiguous fundamental.

'Expansion of Grains tuning'<sup>143</sup> is created through similar just intonation principles, not optimal for centered tonality. The organist must continuously explore unexpected interval qualities through the keyboard range.

While Tristan Murail has worked within 'frequency based composition',<sup>144</sup> Harry Partch created tuning systems suitable for his microtonal instruments. Fixed tuning systems, and the always unique results of acoustic analysis and transformations, have different qualities. Ad hoc tuning systems exist within single fragments, while other systems are explored in a variety of contexts. I will not make a choice between 'fixed' and 'fluid' intonation systems, rather see valuable elements for a larger vocabulary.

CD Track 62: CF Antiphonal groups 5

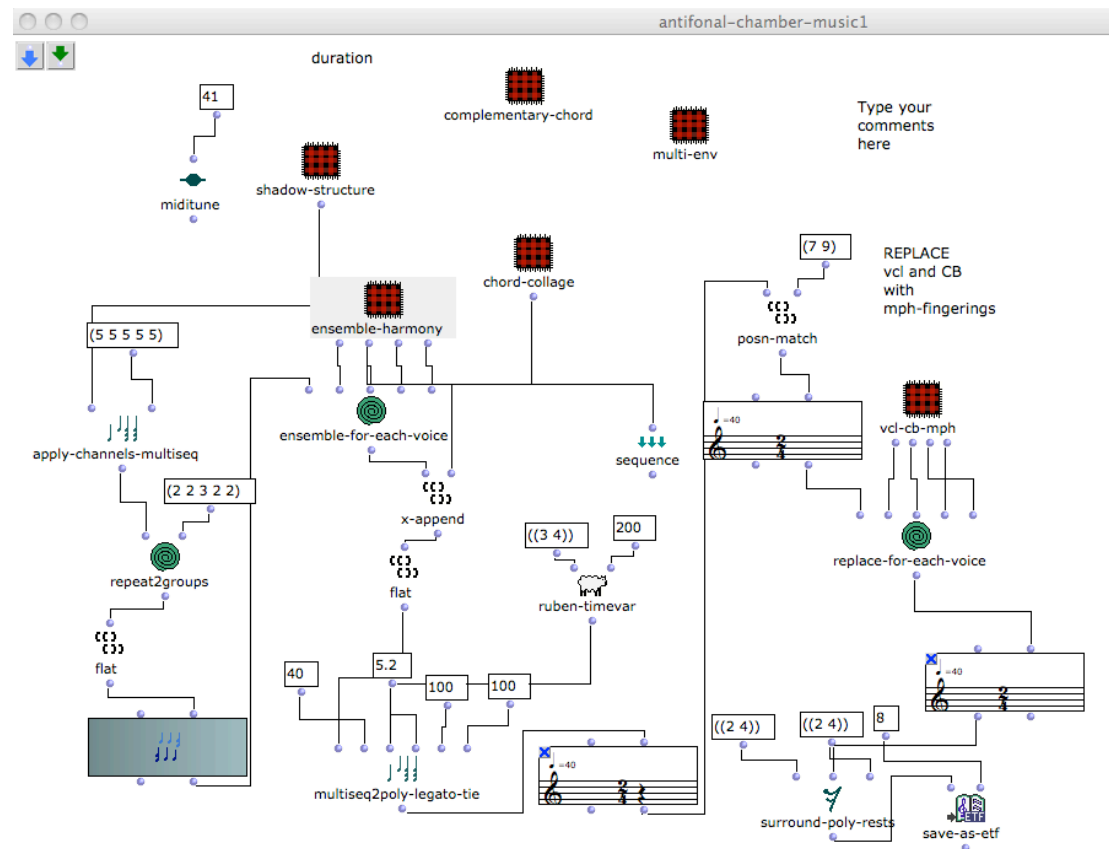
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<sup>143</sup> Ruben Sverre Gjertsen, 2013, 3 Manual Microtonal Organ, p. 15.

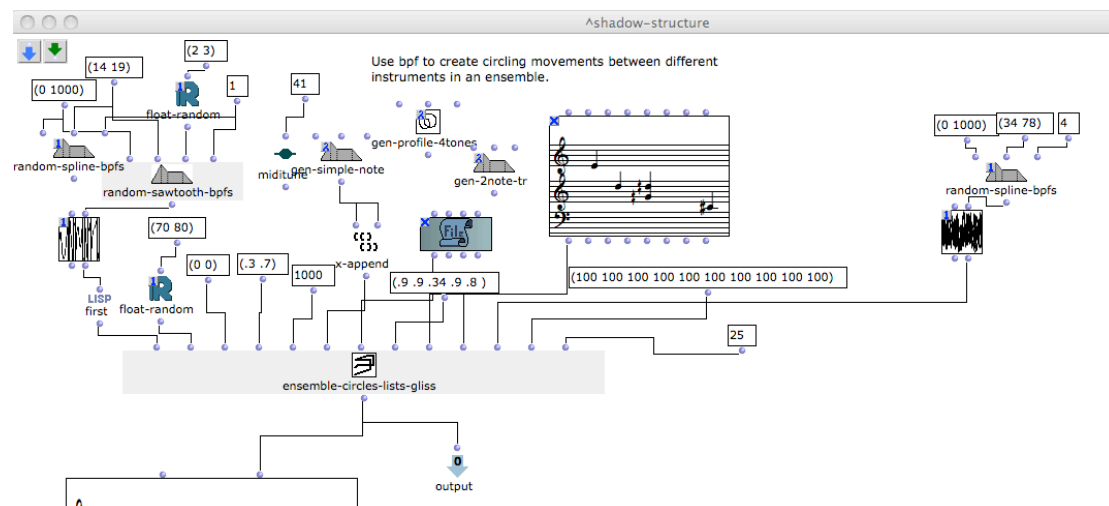
<sup>144</sup> Rozalie Hirs, 2009, Contemporary compositional techniques and openmusic, p. 94.

# Antiphonal chamber music

The *Antiphonal chamber music* fragments have more inner life than the preceding blocks involving the whole ensemble.

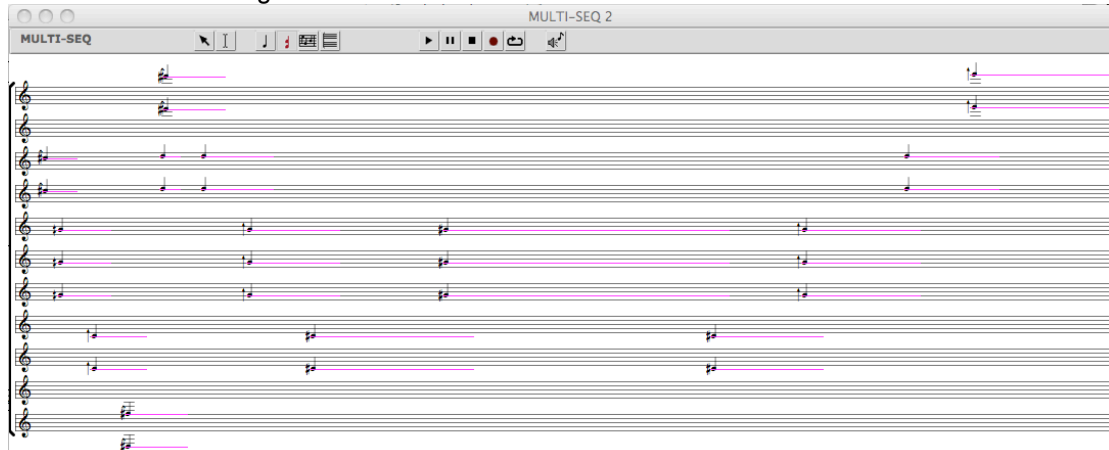


Underlying shadow structures of absent voices are created through circular sawtooth trajectories.<sup>145</sup>



<sup>145</sup> Ruben Sverre Gjertsen, 2013, The Ruben-OM patch library, p. 26.

The shadow structures show entrances for the different instruments. Through slow circular movements, chamber music groups have time to establish. The end of the two upper parts form a basis for a longer violin and celesta duo.



Five groups follow the spatial paths.

- Violin I, celesta.
- Violin II, quartertone glockenspiel.
- English horn, viola, microtonal organ.
- Cello (only multiphonics), percussion II.
- Contrabass (only multiphonics), harp.

A sixth group is spatially spread out:

- Bass flute multiphonics, bass clarinet multiphonics, bassoon multiphonics, trumpet, horn and trombone. The woodwind multiphonics tend to make the group sound larger than it is.

*Antiphonal chamber music* and *Antiphonal groups* are shaped through similar shadow structures. While *Antiphonal groups* are raw structures of spatial 'melodies' or trajectories through static harmonic situations, the 'terrains' of the *Antiphonal chamber musics* are overgrown by melodic activity.

CD Track 63: BB Antiphonal chamber music 1, from the premiere, with spatial distribution.

CD Track 64: Antiphonal chamber music 1, performance from Huddersfield, all musicians are placed on a podium.

## BB Antiphonal Chamber Music 1

**BB Antiphonal Chamber Music 1**

Tempo:  $\text{♩} = 40$

**Violin I**:  $\text{ORD}$ ,  $\text{SP}$

**Celesta**

**Violin II**:  $\text{ORD}$ ,  $\text{ASP}$ ,  $\text{SP}$

**Quartetone/Glockenspiel**: Medium hard sticks

**Percussion I**

**English Horn**:  $\text{oscil. lento}$

**Viola**:  $\text{SP}$ ,  $\text{AST}$ ,  $\text{AST}$

**Microtonal Organ**:  $\text{TRIGGER}$ ,  $\text{II}$

**Cello**:  $\text{M.ph. DIAGONAL BOWING}$ ,  $\text{IV}$ ,  $\text{III}$ ,  $\text{M.ph.}$

**Percussion II**:  $\text{Cymbal arco}$ ,  $\text{2 Triangles Cymbal}$ ,  $\text{delicato}$ ,  $\text{pppp}$

**Contrabass**:  $\text{M.ph.}$ ,  $\text{Cresc. stabile}$ ,  $\text{Very bowing position to find different timbres.}$ ,  $\text{II}$

**Harp**:  $\text{D.C.B.I. E.F.G.A.}$ ,  $\text{près de la table}$ ,  $\text{pp}$

**Bass Flute**

**Bass Clarinet**

**Bassoon**

**Horn in F**

**Trumpet in C**

**Tenor Trombone**

**Electronics**

- 1 -

Rather than becoming antiphonal by responses, imitations and developments of motifs, patterns of entrances and durations are elastic and in constant variation.

Other *Antiphonal chamber music* fragments involve only a quintet:

- Celesta.
- Quartertone glockenspiel. The part is often written to blend with celesta, with quartertones the celesta cannot play. Similarity is found through choice of sticks.
- Microtonal organ.
- Percussion II.
- Harp.

CD Track 65: CR Antiphonal chamber music 5, from the premiere, with spatial distribution.

CD Track 66: Antiphonal chamber music 5, performance from Huddersfield, all musicians are placed on a podium.

The 'pelog variation 15' tuning of the microtonal organ contains 5 different random pelogs. Two of them are used here, at times superposed through sustain pedals to form dense interferences, between each other and against the 3 equal tempered instruments.

The short ensemble version *Landscape with figures IIb* offered a chance to experience how fragments would work with the ensemble conventionally placed on a single stage. The premiere in Oslo was transparent, while the short version performed in Huddersfield sounded more massive, for a few possible reasons:

- Musicians had more amplification.
- St. Pauls Hall in Huddersfield is very resonant.
- The piece was getting more familiar for the ensemble.
- Some musicians found it more comfortable to be sitting together.

Both situations have qualities, it would be interesting continue the spatial setup ideas in a larger orchestral format.

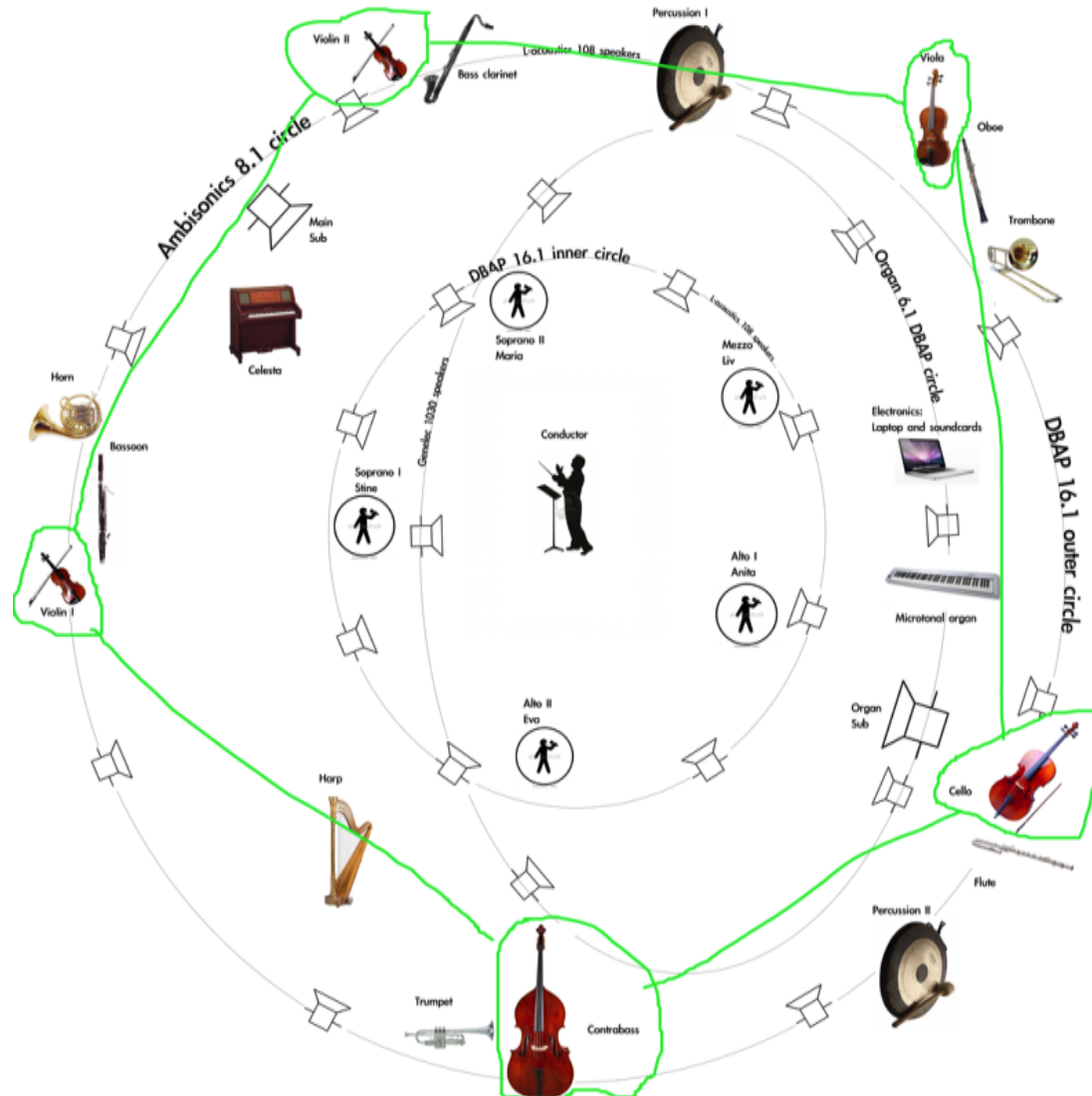
## CR Antiphonal Chamber Music 5

The musical score for *CR Antiphonal Chamber Music 5* is presented for six instruments. The tempo is marked as  $\text{♩} = 40$  and the time signature is  $\frac{2}{4}$ . The score is divided into two systems, each ending with a  $\frac{5}{8}$  measure.

- Celesta:** The first system features a melodic line starting with a  $p$  dynamic. The second system continues the melodic development.
- Quartertone Glockenspiel:** The first system is marked with 'Medium hard sticks' and a  $p$  dynamic. The second system includes a 'Thai gong' (marked with a 'C' in a box) and a  $p$  dynamic.
- Percussion I:** The first system includes tuning instructions: 'Tuning: Random Pelog 15', 'I Diapasons 8'', and 'II Diapasons 8''. The second system features two keyboard variations: 'I: 1 (Pelog-variation A)' and 'II: 3 (Pelog-variation C)', with dynamics  $pp$  and  $p$ .
- Microtonal Organ:** The first system is marked with  $pp$ . The second system features two keyboard variations: 'I: 1 (Pelog-variation A)' and 'II: 3 (Pelog-variation C)', with dynamics  $pp$  and  $p$ .
- Percussion II:** The first system is marked with  $pppp$ . The second system includes a 'Flat Tam-tam' (marked with a 'O' in a box) and a 'brush' (marked with a 'P' in a box), with dynamics  $pppp$  and  $pppp$ .
- Harp:** The first system is marked with  $p$ . The second system includes a chord sequence: 'D Cb B# / E F G# A', with dynamics  $p$  and  $mf$ .

## Noise circles

The first two noise circles are composed on top of two existing *Gamelan Ravel* fragments from the sound installation. Voices and strings form the most complete inner and outer circles within the setup.



10 live parts form a polyphony of 2 parallel spatial trajectories, a flux within multiple rotations through the room.

CD Track 67: BC Noise circles 1

Dolcissimo, no dynamic nuances. **BC Noise circles 1**

♩ = 50

**S1: Stine**

**S2: Maria**

**M: Liv**

**A1: Anita**

**A2: Eva**

**Violin I**

**Violin II**

**Viola**

**Cello**

**Contrabass**

**Electronics**

Track: GamelanRavel31

Duration 49'' + resonance  
If performed in tempo, this fragment should be about the same length.

- 1 -

Roles are inverted; electronics have the most pitched elements, while live voices move through nuances of noise. For the strings, the *Noise circles* are like etudes of multidimensional performance, with the bridge clef also used by Helmut Lachenmann.<sup>146</sup> Polyphonies of playing techniques on a single instrument have been taken to larger extremes by Klaus K. Hübler. The bridge clef was chosen as the visually most clear notation for the *Noise circles*.

In *BC Noise circles 1*, bowings are vertical; lightly brushed or heavily pressed.

In *CC Noise circles 2*, all bowings are circular, with lights sounds of friction, while pitches are in continous flux.

*DE Noise circles 3* is for voices only. Delayed choir harmonizations on the parts of Anita and Eva expand the vocal ensemble towards the bass register. The fragment is accompanied by heavy rain, until the end of *Landscape with figures II*.

It is fairly new to me to follow a single structural idea though a whole movement. Ad hoc bubbles would rise and fall, new problems were to be solved for every bar. Some fragments from *Landscape with figures II* are in this sense less fragmented than my past works.

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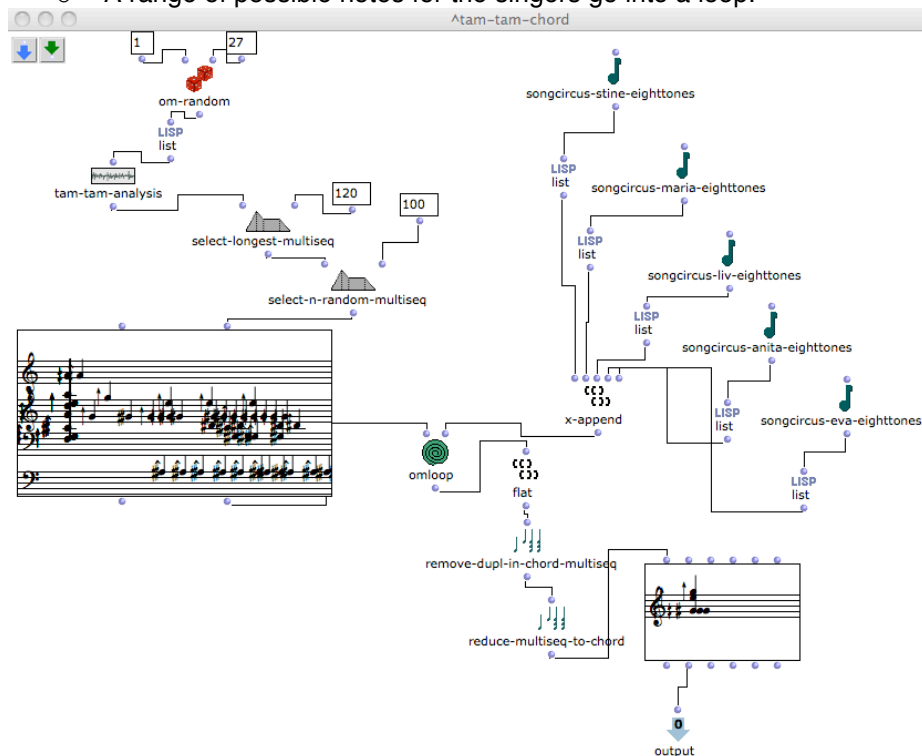
<sup>146</sup> <http://www.breitkopf.com/feature/werk/1129>



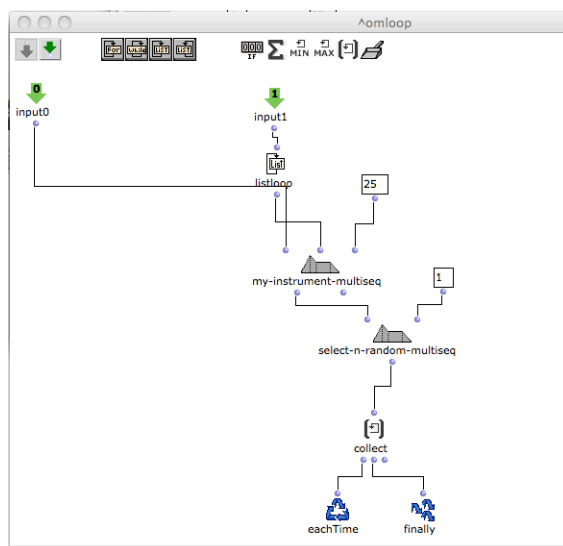
## Vocal gliss

The *vocal gliss* fragments are short signals appearing at different times during the work. Initial and final points of the glissandi are found from the same set of tam-tam analyses used in sound installation fragments. These partial trackings<sup>147</sup> go through a chain of filterings.

- Only partials longer than 120 milliseconds are used. This will strongly reduce the amount of information.
- 100 random partials are selected.
- A range of possible notes for the singers go into a loop.

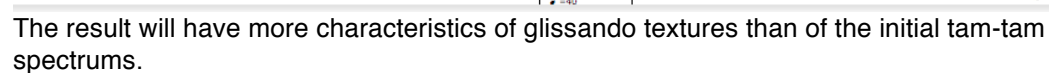


- For each singer, only partials less than 25 cents away from a possible note are passed through.
- Only one random partial is necessary for each voice.



<sup>147</sup> Done through the pm2 library for Open Music: <http://repmus.ircam.fr/openmusic/libraries>

- A glissando is created between the two tam-tam chords, curves are used as pitch shapes during the transitions.
- Orchestral envelopes of attack and decay are added to the glissando texture, the overall duration is adjusted.



The raw materials contained intermediate tones for a useful MIDI playback. Not all of this information was necessary for a live performance.

The image displays a musical score for five staves, likely for a guitar or piano. The notation is complex, featuring various rhythmic values, accidentals, and fingerings. The score is organized into three systems, each containing five staves. The first system (measures 1-8) includes fingerings such as 5, 6, 7, and 8. The second system (measures 9-16) includes fingerings like 3, 5, 6, 7, 12, 14, 17, and 18. The third system (measures 17-24) includes fingerings like 3, 5, 6, 7, 12, 14, 17, and 18. The notation includes many accidentals (sharps, flats, naturals) and complex rhythmic patterns, suggesting a highly technical piece.

The final score was simplified to only show glissando directions. The very high vocal register of Stine Motland gave a character to this fragment.

## CD Vocal gliss 4

All vocal gliss fragments are a capella.  
Vary dynamics individually between p and mf.  
Continuous improvised phonetic transitions, emphasize overtones through throat singing where possible.  
Glissando is continuous.  
At the final notes, oscillate slowly to keep pitch in motion.

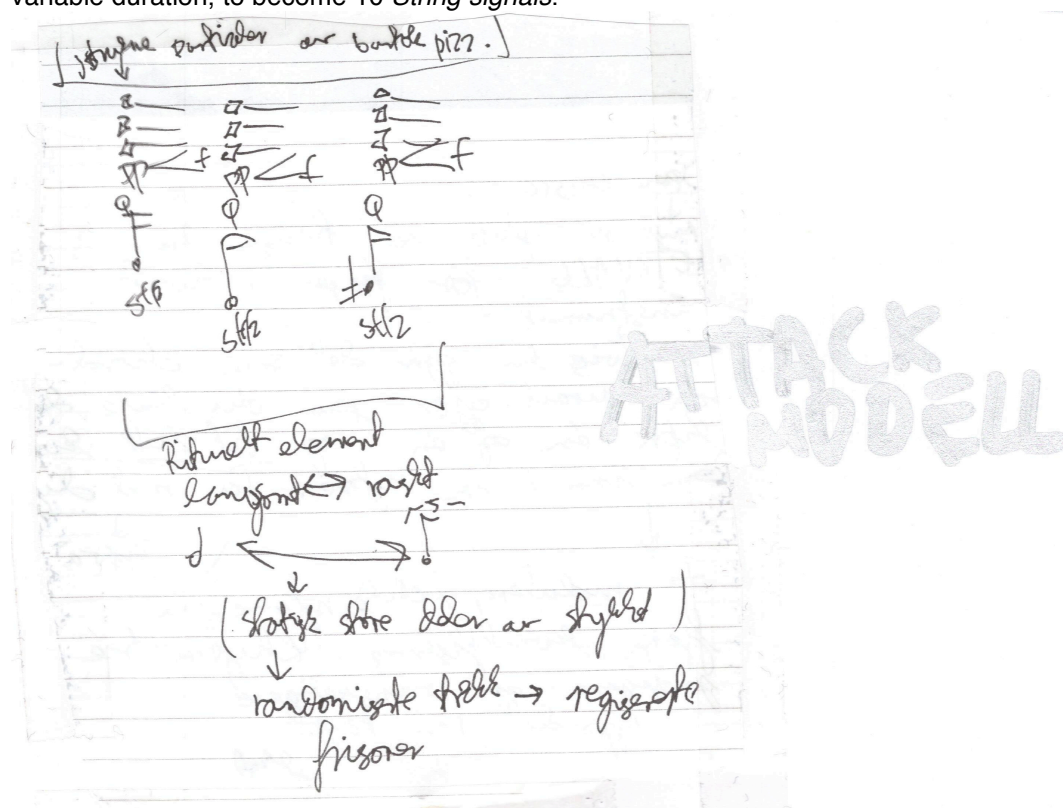
The musical score for 'CD Vocal gliss 4' consists of five staves, each representing a different vocal part: S1: Stine, S2: Maria, M: Liv, A1: Anita, and A2: Eva. The score is organized into three systems. The first system begins with a 5/8 time signature and a tempo marking of 40. The second system features a 3/4 time signature. The third system features a 3/8 time signature. Each staff contains musical notation with various glissando markings and other musical symbols. The notation is written in a simplified style, focusing on glissando directions.

- 1 -

CD Track 68: CD Vocal gliss 4

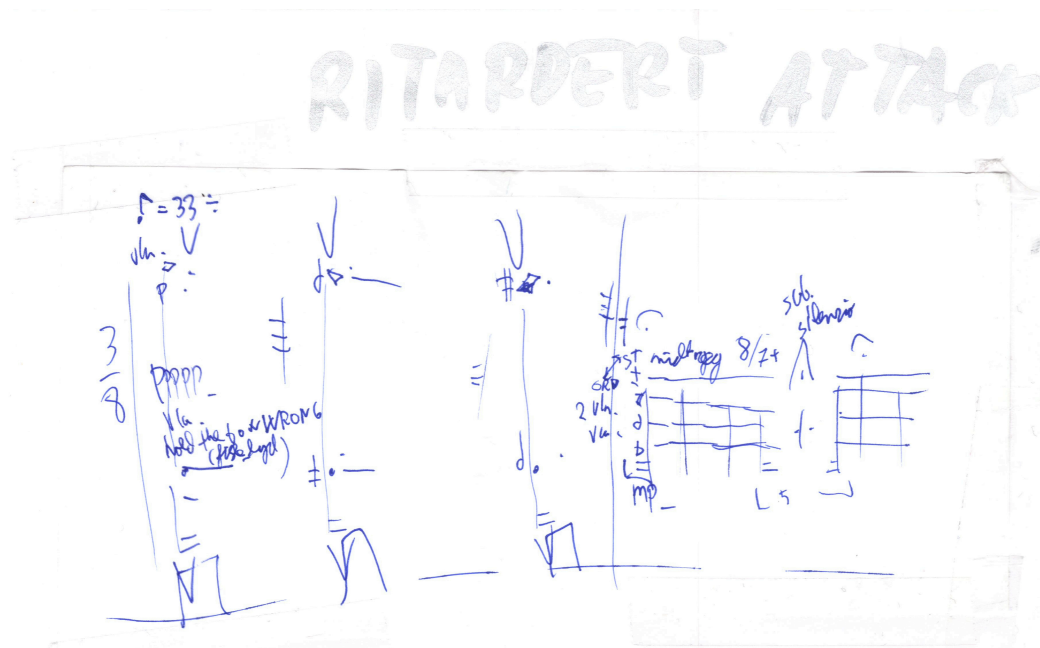
## String signals

The string signals were planned in the sketches as general principles for ritual<sup>148</sup> elements of variable duration, to become 10 *String signals*.



At times they are stretched into more meditative situations, especially towards the end of *Landscape with figures II*. One string player plays a percussive sound while others play chords of normal notes or harmonics, in mechanical repeats and poly rhythms. The function of percussive sounds change as they drift against the chord element; the attack sound, an independent sound, or the cutoff sound. This issue of synchronization is related to random superposition of elements in the sound installation. Fragments of basic musical situations, like chords versus attack sounds, will have different functions based on the context they appear in.

<sup>148</sup> Meaning abrupt and rigid.



The first *String signal* is a rapid exposure of the idea.

CD Track 69: AD String signals 1

In the last *String signal* the idea has been stretched out.

CD Track 70: CG String signals 10

The *String signals* are mechanical situations.

"The researcher can only describe, for instance, the seasonal rotation of a place based on four general types of sounds: natural, animal, technical, and human."<sup>149</sup>

Sounds and types of musical ideas can thought in such categories. A metaphorical world, or a 'terrain', places the human within a larger context of nature, animal and the mechanical.

<sup>149</sup> [Multiple\_authors], 2005, Sonic experience A Guide to Everyday sounds, p. 5.

## Intermezzi fragment

The piece Intermezzi for 8 voices (SSAATTBB) [15'30"] was written 2004,<sup>150</sup> and has never been performed. Through studies of phonetics (IPA),<sup>151</sup> descriptions of vocal possibilities by Trevor Wishart,<sup>152</sup> and notation in *Time and motion study III*<sup>153</sup> by Brian Ferneyhough, a multidimensional vocabulary for voices was found. The singers would need to continuously master combinations of:

- Quartertone intonation with minor inflections.
- A vocabulary of sounds from normal tone to noise:
  - Normal voice.
  - Half breath, half voice.
  - Pitched breath.
  - Whisper.
  - Spoken, relative pitches ("sprechgesang").
  - Head tones.
  - Transitions between normal and head tones. The technique is related to yodeling, while doing it as a trill or ornament on a single note, can create intentionally awkward effects, like instabilities of pitch or register jumps. If head tones are not available in the register on the particular voice, a headtone can be simulated by a breathy voice.
  - Half-lunged multiphonic.<sup>154</sup>
  - Indrawn air used on most other sonorities.
  - Lung flutter.<sup>155</sup> Trevor Wishart demonstrated this on the accompanying cd, but singers avoided it in my pieces, as it could be harmful to the voice.
  - Unpitched roar.<sup>156</sup> These sounds come from exaggerated air stream splitting tones into noise.
  - Subharmonics. These can range from stable suboctaves to irregular vocal clicks. Transitions between normal voice and subharmonics are possible. These are mostly known vocal techniques which have been defined and used elsewhere. This piece requires the capability to switch fluently through a large repertoire of human sounds.
- Degrees of vibrato used as ornamentations. The default sound is non vibrato.
- Amplitude vibrato, "almost like laugh,"<sup>157</sup> used in performances of Monteverdi.
- Hand movements in front of the mouth.
- The international phonetic alphabet (with minor exceptions in definitions). Charts with sound examples exist,<sup>158</sup> though interpretations of phonemes tend to have slight differences between these demonstrations.
- Overtone singing. Phonetic transitions and combinations were attempts to capture overtones in notation, as clear as possible with nasal qualities. Overtone singing, whenever possible has been an intention in all my works involving singers. The result will naturally depend on type of voice and available formants in the particular register, and experience with mongolian vocal techniques.
- Multiplexes.<sup>159</sup> My version of this improvisational category demonstrated by Trevor Wishart is writing multiple trills, defining all components of the improvisations through phonetics and the above mentioned types of vocal timbres.

For several works after Intermezzi, I narrowed the range of sonorities down for practical reasons. The collaboration with the vocal ensemble Song Circus gave a possibility to have

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<sup>150</sup> <http://www.bek.no/~ruben/Works/intermezzi.html>

<sup>151</sup> <http://www.langsci.ucl.ac.uk/ipa/>

<sup>152</sup> Wishart, 1996, On Sonic Art.

<sup>153</sup> <http://www.edition-peters.com/>

<sup>154</sup> Wishart, 1996, On Sonic Art, p. 273.

<sup>155</sup> Wishart, 1996, On Sonic Art, p. 264. The sound is demonstrated and named "windpipe".

<sup>156</sup> Ibid. p. 271.

<sup>157</sup> Ibid. p. 274.

<sup>158</sup> Ladefoged, 2003, Vowels and Consonants, 191. <http://www.langsci.ucl.ac.uk/ipa/>

<sup>159</sup> Wishart, 1996, On Sonic Art, p. 278.

All the 16 *Intermezzi Fragments* in *Landscape with figures II*, are self quotations taken out from the context of the older work *Intermezzi*, rearranged for 5 female voices.

[illegible][illegible]



Some sounds would have to be skipped or summarized in a single voice. In this example the deep notes did not need to be skipped, as Eva Bjerga Haugen can reach well down in a tenor register.

AB

### Intermezzi fragment 1

Intermezzi fragment 1 musical score, measures 1-4. The score is for five voices: S1: Stine, S2: Maria, M: Liv, A1: Anita, and A2: Eva. The tempo is 60 beats per minute. The time signatures are 3/4, 5/4, 2/8, and 4/4. The score includes various musical notations such as notes, rests, and dynamic markings (f, mf, pp, mp, sf, ff). There are also performance instructions like 'nervoso', 'in rilievo', 'NORM', 'NASAL', 'UNSTABLE', 'oscil. lento', and 'mp > p'.

### Intermezzi Fragment 2

Intermezzi Fragment 2 musical score, measures 5-8. The score is for five voices: S1: Stine, S2: Maria, M: Liv, A1: Anita, and A2: Eva. The tempo is 60 beats per minute. The time signatures are 4/4, 2/4, 2/8, and 2/4. The score includes various musical notations such as notes, rests, and dynamic markings (f, p, mp, sf, ff). There are also performance instructions like 'water-effect', 'vibr. accel.', 'rit.', 'accel.', 'NORM', 'NASAL', 'STABLE', 'NOISE', and 'smfz p'.

### Intermezzi Fragment 3

Intermezzi Fragment 3 musical score, measures 9-12. The score is for five voices: S1: Stine, S2: Maria, M: Liv, A1: Anita, and A2: Eva. The tempo is 40 beats per minute. The time signatures are 2/4, 4/4, 5/8, and 2/4. The score includes various musical notations such as notes, rests, and dynamic markings (mf, mp, pp, sf, ff). There are also performance instructions like 'oscil. lento', 'NV', 'static', 'water-effect', 'NASAL', and 'leggero'.

- 1 -

CD Track 71: AB Intermezzi fragments 1-3

Some places it would be hard for a five part group to reproduce the sonorities of an eight part group. The problematic initial lung flutters were not included in the quotation.

- 39 -

In this example, the choir harmonizer<sup>160</sup> adds remaining bass and tenor tones to the voice of Eva, in just intonation ad hoc tuning. Examples of this tuning approach are shown for the *Antiphonal groups*. Related 'pure intervals'<sup>161</sup> replace equal tempered notations. The chord goes through many of the above mentioned inflections of timbre and vibrato.

- Notes transform between full sound and half breath.
- The 'yodeling' transitions between normal and headtone are present in Eva's part. This register was better suited for real headtones for the tenor parts from *Intermezzi*.
- Normal airstream transitions to half-lunged multiphonics. The difference from subharmonics sounds is that multiphonics generally are in a higher register. Grainy, whistling, improvised or stable sounds are possible, and phonetics define register and timbre of multiphonics. Some improvisers will have a large vocabulary within these types of sounds.

### BM Intermezzi Fragment 12

Voices doubled in unison by absolute frequencies (as intonation assistance)

Live electronics on A2:

All INPUTS OFF

## CD Track 72: BM Intermezzi fragment 12

<sup>160</sup> The psychoartist~ MaxMsp object from Ircam.

<sup>161</sup> Meaning based on simple number ratios from the overtone series.

Subharmonic voice and half-lunged multiphonics are both results of low air pressure on the vocal chords. Transitions from tone to multiphonics or subharmonics imply gradually diminishing air pressure, while a transition from subharmonic to multiphonics can be done with a constant low air pressure, while gradually moving upwards in register. Outbursts of amplitude vibrato adds a conflict, as the higher air pressure will cause outbursts of normal voice. This is intended, the score is a map of actions to perform, not an exact notation of timbral phenomena.

### CD Track 73: AO Intermezzi fragment 11

**AO Intermezzi Fragment 11**

The score is divided into three measures with time signatures 2/8, 4/4, and 5/4. The vocal parts are S1: Stine, S2: Maria, M: Liv, A1: Anita, and A2: Eva. The notation includes various dynamics (mf, f, p, mp, ppp, sfz), articulations (accents, slurs), and performance instructions (amp. vibr., M.ph., subito tacet, water-effect, subito silenzio, rall., irregular capriccio, whistle tones, noise). The score is a map of actions to perform, not an exact notation of timbral phenomena.

The water effects are slurping sounds with inhaled breath.<sup>162</sup> Vowel transitions on breath sounds create transitions of pitch. Trills at the go between two different sounds. This is a simple version of what Trevor Wishart could define as a multiplex. I did not include multiplexes with many sounds in *Landscape with figures II*, while there are examples in the score of *Intermezzi*. Song Circus came closer to the multiplex idea through their live and preprocessed Joyce-improvisations.

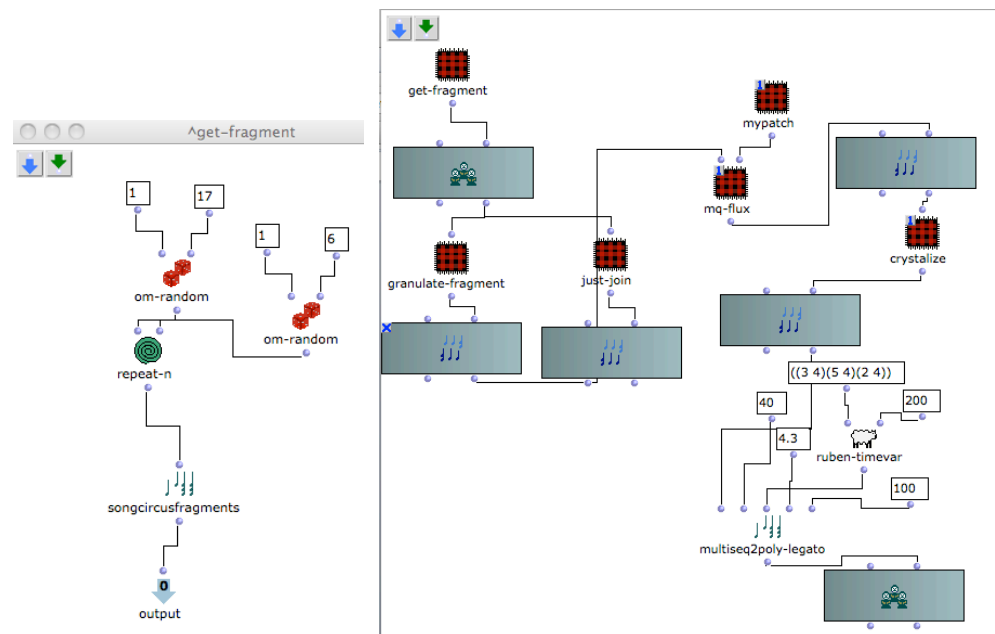
The vocal writing was a beginning for all the *Intermezzi fragments*, ensemble parts were composed on top of many of them, to various degress, thickening existing vocal textures or presenting coexisting parallel strata. Only in rare cases were the quartertones doubled by microtonal organ.

<sup>162</sup> Wishart, 1996, On Sonic Art, p. 274.

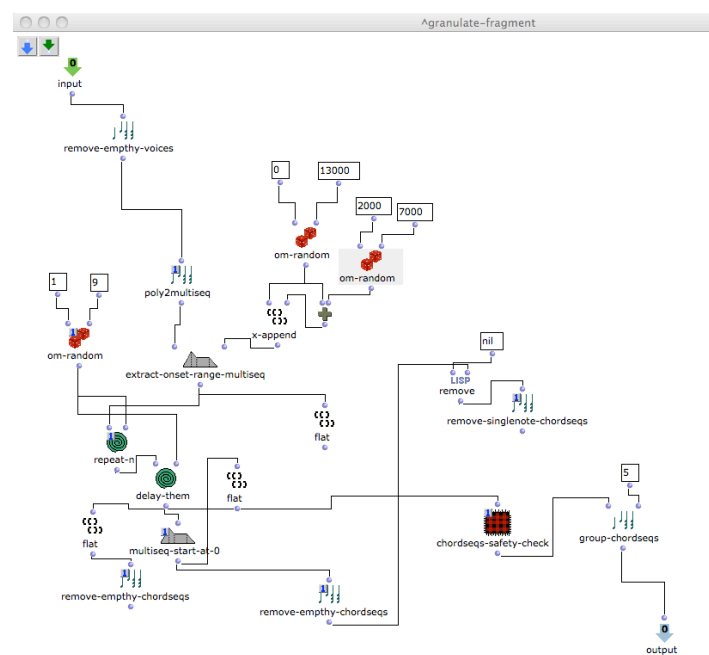
## Intermezzi variation

So far, historic quotations by Ravel, and my own ideas, have gone through a large number of distortions to create new musical ideas. The *Intermezzi variations* are also such distortions and reinterpretations, of the original 16 *Intermezzi fragments*.

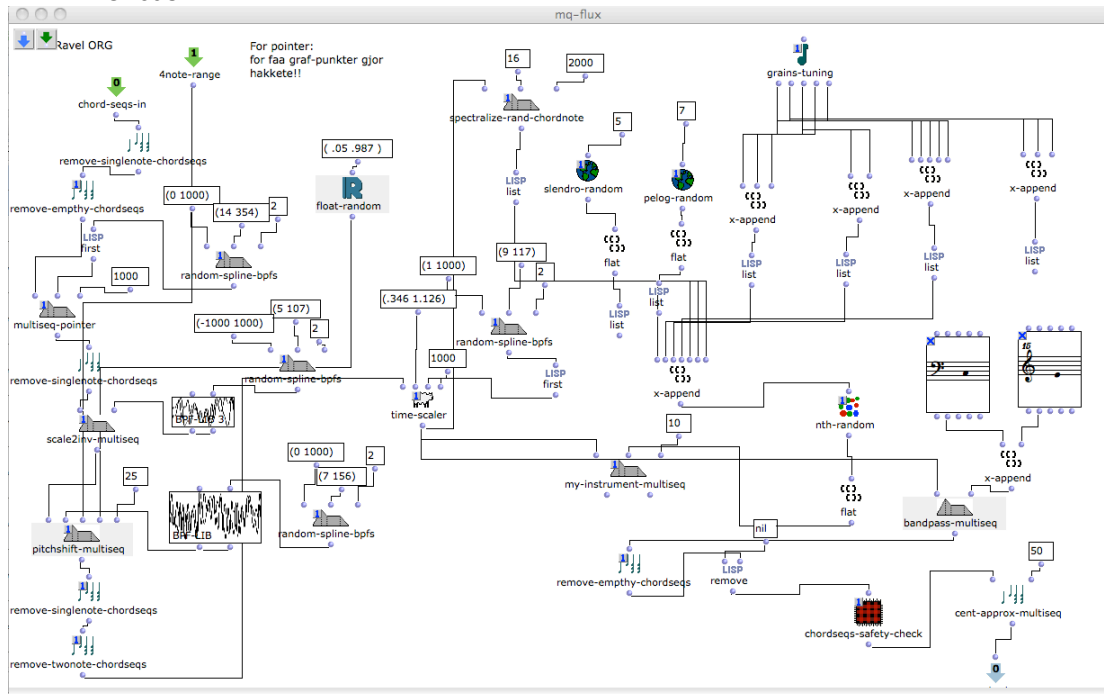
- The original *Intermezzi* quotations (numberings were changed from 17 to 16 during the process) were typed into Open Music, with MIDI channel numbers representing types of vocal sonorities, an attempt to maintain original sonorities. This music deals with timbre, just as much as with pitch. 1-6 selected fragments were superposed for further transformations, for hybrids of existing *Intermezzi fragments*.



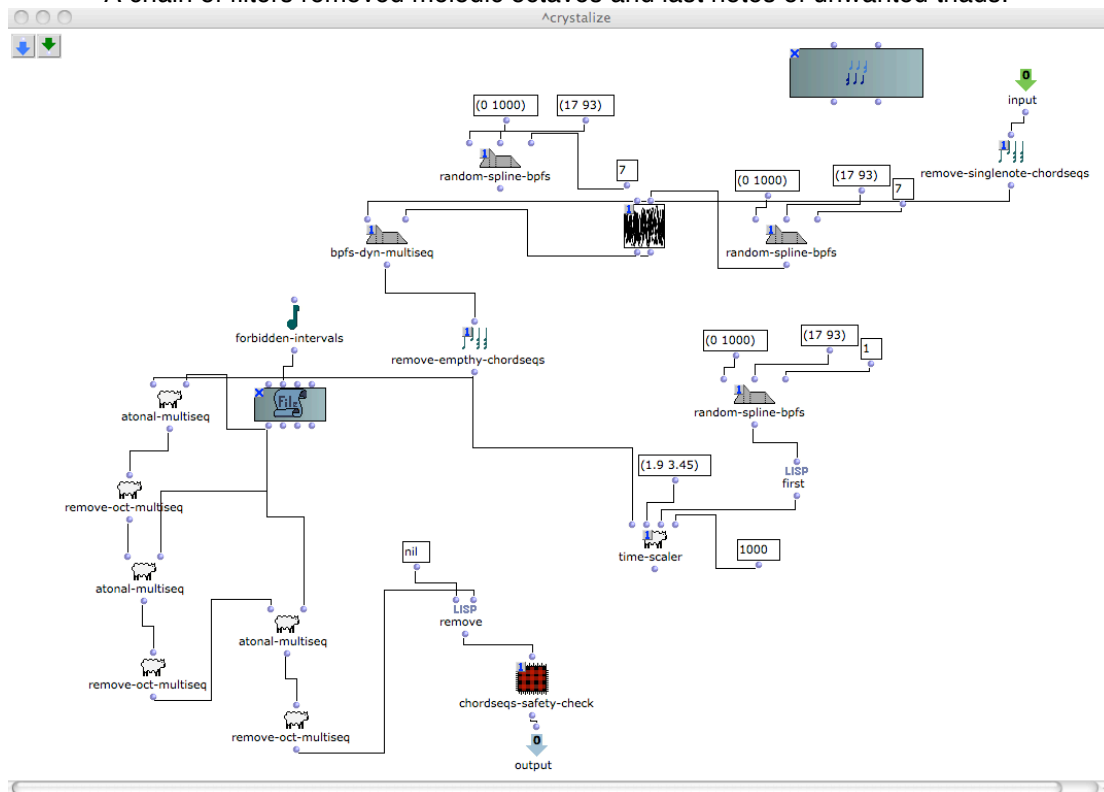
- Multiple fragments were either simply joined into 5 voices, or 'granulated' like many of the above mentioned Ravel manipulations.



- Further transformations used the same patch as for Ravel transformations, except that approximations to microtonal tuning systems were skipped. Only 1/4-tones or 1/8-tones would be practical for a live performance. A time-pointer, scaling to inversion, pitchshifting and time-scaling could create an endless number of variations from a limited material, filtered to stay inside the practical vocal range for Song Circus.

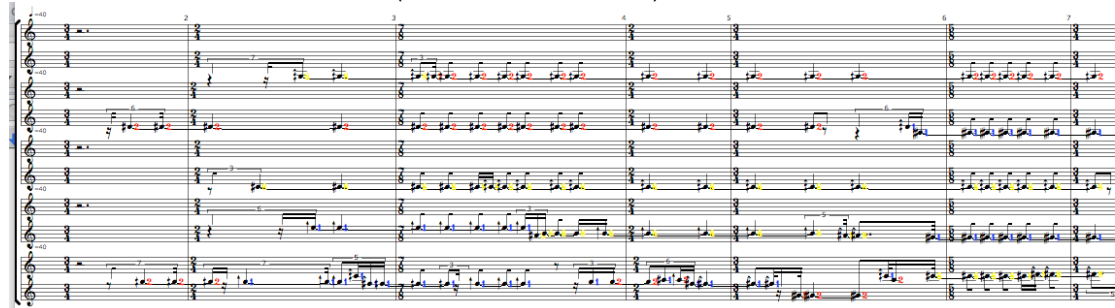


- A chain of filters removed melodic octaves and last notes of unwanted triads.<sup>163</sup>



<sup>163</sup> Not included in the public Ruben-OM library.

While *Intermezzi fragments* were composed by rearranging fragments of an old piece, the *Intermezzi variations* were composed interpreting the computers distortions of the materials. We will look at an example, where vocal timbres from the source tones are represented as coloured MIDI channel numbers (1 means normal tone).



The score was exported for interpretation. Voices were reordered to better fit the vocal ranges. Notes and rhythms can be recognized, while intonations were changed, passages were simplified, searching for harmonic and melodic situations I found more satisfactory.

- A1, measure 1: A 1/4-tone interference to the note of M can give a more focussed harmonic situation. And the possible E major third will be avoided, replaced by the 3/4-tone interval I have often preferred to halftones in my music.
- S2, measure 2: I preferred a 1/4-tone melodic interval to the more familiar halftone, and it could extend harmonically as S1 stays on bb'.
- S1, measure 8: Lowering the f#" by a 1/4-tone helps avoiding a D major association, through a 'neutral third'.
- S2, measure 8: The high g' is approximated upwards, as a 'neutral third' is preferred to a minor third against A1.

## CD Track 74: AX Intermezzi Variation 1

Text: Demian Vitanza

### AX Intermezzi Variation 1

The musical score for AX Intermezzi Variation 1 is presented in two systems. The first system consists of four measures with time signatures 3/4, 7/8, 2/4, and 3/4. The second system also consists of four measures with time signatures 3/4, 5/8, 3/4, and 2/4. The score features five vocal parts: S1: Stine, S2: Maria, M: Liv, A1: Anita, and A2: Eva, along with an Electronics part. The vocal parts are written in treble clef, while the Electronics part is in bass clef. The score includes various musical notations such as notes, rests, dynamics (pp, mf, p, ppp), and performance instructions like 'Hand megaphone', 'INHALED M.ph.', 'Non vibr.', 'Vibr.', and 'Amp. vibr. outbursts'. The lyrics 'NASAL', 'permutations', and 'My' are also present.

The image displays two musical score excerpts for a vocal ensemble. The first excerpt is in 2/4, 5/4, and 4/4 time signatures, featuring lyrics 'vo-cal chord is a highway full of traffic.' and various musical notations like 'mf', 'mp', 'ff', 'pp', 'Overtones', and 'NASAL'. The second excerpt is in 4/4 and 2/4 time signatures, featuring the instruction 'sub. silenzio' and various musical notations like 'mf', 'mp', 'ff', 'pp', 'Overtones', and 'NASAL'.

It was always necessary to try everything out with my own voice, to see whether the timbral transitions made sense physically in a particular speed.

Compositional rules are not explicitly formulated, the comparisons above can help finding principles behind my choices. It's an example of how raw materials often are not sufficient by themselves, but trigger sets of musical choices.

Through his studies of Boulez, Erling E. Guldbrandsen added nuances to a understanding of musical structure and techniques during the composition process:

"This compositional method could primary be called pragmatic. With a given musical material, Boulez is prepared to use it for his purposes, that is *new* purposes, obviously without the slightest worry for the internal, *structural* logics, which contributed to generating the materials. It is not at all a question about *one* work controlled by *one* basic stucture, *one* series, *one* formula, in order to form musical coherence."

164

<sup>164</sup> Our translation, the original: "Denne kompositoriske fremgangsmåten må først of fremst kunne kalles pragmatisk. Når et gitt musikalsk stoff foreligger, er Boulez i rede til å bruke det til sine formål, dvs. til *nye* formål, åpenbart uten den ringeste bekymring for den interne, *strukturelle* logikken som i sin tid bidro til at stoffet ble generert. Det er overhodet ikke tale om at *ett* verk må være styrt av én grunnstruktur, én serie, én formel, for at det skal kunne henge sammen musikalsk." Guldbrandsen, 1997, Acta Humaniora, 23, p. 436.



*Finnegans wake* was a main text through *Landscape with figures II*, improvisations and recordings. I used a text by Demian Vitanza for the *Intermezzi variation* fragments.<sup>165</sup>

**"Shhh**

Shhh, shhh shhh/she says...

shhh, shhh, shhh/she sings away silence/sings away death/thinking too much/she  
sings/sickness/sadness/sucks out her soul

Shhh, Shhh, Shhh/she sings/

Silence is death/thinking too much/she says/

Silence would kill her, would kill me.

Go on and kill me.

Go on and sing me.

Sing me and sing me, sing away silence.

Silence chokes my lungs, my soul.

What soul?

My guts!

Like worms eat guts.

They break.

They burst.

At dawn of silence.

Death of sound.

Of sound.

Of sound.

When I stop singing, talking, thinking, walking, whispering, shouting, I'll be gone, ding dong dead, gone  
where? Mum? Dad? Song? Dead? Gone? Just gone? Just dead? How dead? How gone? Like sound is  
gone from silence?

(...)

My vocal chord is a highway full of traffic.

(...)

This walls, these words, regurgitating. "

---

<sup>165</sup> The text was written as part of a collaboration at a librettist academy 11th to 13th of october 2012, organized by Bergen nasjonale opera, AdOpera Utvikling and Dramatikkens hus.

# Landscape with figures IIa

*Landscape with figures II* was a large production. I suggested preparing an alternative version for Song Circus with electronics. The modular nature of the work made it possible to rearrange it to 2 shorter versions for separate performances.

*Landscape with figures IIa* was made for Song Circus, planned for performance 16/3-2014 in Stavanger. It was natural to include all the Intermezzi fragments and variations, where the ensemble parts were composed on top of existing vocal parts, while the antiphonal parts would make less sense without the ensemble.

## Landscape with figures IIa [45"]

- **EA** (AB) Intermezzi Fragments 1-3 [17"]
- **EB** (AY) Whispering room 6 [45"]
- **SOUND INSTALLATION: Landscape with figures**
- **EC** (AF) Intermezzi Fragment 4 (within sound installation) [18"]
  - **ED** (AI) Vocal Gliss 1
  - **EE** (AH) Intermezzi Variation 6 *Repeated later!* [57"]
  - **EF** (CE) Intermezzi Variation 15 *Repeated later!* [5"]
  - **EG** (BY) Tutti Fragment 4 [1'47"]
  - **EH**(AV) Intermezzi Fragment 14 *Repeated later!* [9"]
  - **EI** (AX) Intermezzi Variation 1 [45"]
  - **EJ** (AS) Vocal Gliss 3
  - **EK** (AM) Whispering room 1 [78"]
  - **EL** (AK) Tutti Fragment 2 [2'21"]
  - **EM** (BA) Intermezzi Variation 5 *Repeated later!* [11"]
  - **EN** (BU) Intermezzi Variation 8 *Repeated later!* [38"]
  - **EO** (CC) Noise Circles 2 (with soundtrack) [84"]
  - **EP** (BE) Intermezzi Fragment 6 [25"]
  - **EQ** (AP) Intermezzi Fragment 7 [37"]
- **SOUND INSTALLATION: Landscape with figures**
- **ER** (AQ) Intermezzi Fragment 15 (within sound instalation) [6"]
- **ES** (CA) Intermezzi Variation 4 (within sound instalation) [9"]
- **EN** (BU) Intermezzi Variation 8 (within sound instalation at this second appearance) [38"]
- **ET** (CO) Intermezzi Fragment 13 (within sound installation) [9"]
- **EU** (BV) Intermezzi Fragment 8 (within sound installation) [21"]
  - **EV** (CM) Intermezzi Variation 14 [18"]
  - **EW** (AU) Intermezzi Fragment 5 [10"]
  - **EX** (BO) Vocal gliss 2
  - **EY** (AT) Tutti Fragment 3 [27"]
- **EZ** (CT) Intermezzi Variation 12 [22"]
- **FA** (CS) Intermezzi Variation 11 (with soundtrack) [21"]
- **FB** (CP) Tutti Fragment 8 [28"]
- **FC** (BK) Intermezzi Fragment 10 [11"]
- **FD** (BJ) Intermezzi Fragment 9 [18"]
- **FE** (BM) Intermezzi Fragment 12 [12"]
- **FF** (BC) Noise Circles 1 [49"]
- **EH** (AV) Intermezzi Fragment 14 [9"]
- **FG** (AO) Intermezzi Fragment 11 [18"]
- **FH** (BF) Tutti Fragment 7 [29"]
- **FI** (CI) Intermezzi Variation 2 [21"]
- **FJ** (CH) Tutti Fragment 6 [32"]
- **FK** (CD) Vocal Gliss 4
- **FL** (CJ) Intermezzi Variation 3 [21"]
- **FM** (CU) Intermezzi Variation 13 [16"]
- **FN** (CB) Whispering room 3 [53"]
- **FO** (BG) Intermezzi Variation 9 [19"]
- **EM** (BA) Intermezzi Variation 5 [11"]
- **FP** (BR) Intermezzi Variation 7 [25"]
- **SOUND INSTALLATION: Landscape with figures** (no orchestral chords or Ravel percussion)
- **EE** (AH) Intermezzi Variation 6 [57"]
  - **EF** (CE) Intermezzi Variation 15 [5"]
  - **FQ** (DB) Intermezzi Variation 16 [21"]
- **SOUNDScape**
- **FR** (CW) Intermezzi Variation 10 (within soundscape) [11"]
- **SOUND INSTALLATION: Landscape with figures**
- **FS** (DD) Intermezzi Fragment 16 (within sound installation) [45"]
  - **FT** (DE) Noise Circles 3 (with soundtrack)
- **SOUNDScape** (overlap from previous) [40"]

# Landscape with figures IIb

*Landscape with figures IIb* was made for Oslo sinfonietta and premiered 23/11-2013 in St. Pauls Hall, Huddersfield, during the Huddersfield Contemporary Music Festival. Even more parts were cut for the work to fit into the programme and the schedule of BBC as a 20' piece. All the *Intermezzi* fragments and variations depended strongly on the voices, while *Antiphonal chamber music* fragments were already purely instrumental. It became a denser piece, as the more meditative fragments and soundscapes had to go out.

## Landscape with figures IIb [32']

- **SOUNDSCAPE (before AA) [50"]**
  - **GA** (AA) Ensemble Fragment 1 (with soundtrack) [20"]
  - **GB** (AJ) Ensemble text 1 (with soundtrack) [60"] *Repeated later!*
  - **GC** (AK) Tutti Fragment 2 [2'21"]
  - **GD** (AD) String signals 1 [7"]
  - **GE** (AZ) Antiphonal Chamber Music 7 [15"]
  - **GF** (CH) Tutti Fragment 6 [32"]
  - **GG** (BB) Antiphonal Chamber Music 1 [1'20"]
- **SOUND INSTALLATION: Landscape with figures**
- **GH** (AW) String signals 9 (within sound installation) [6"]
- **GI** (AG) String Signals 8 (within sound installation) [14"]
  - **GJ** (AT) Tutti Fragment 3 [27"]
  - **GK** (BL) Antiphonal Chamber Music 2 [32"]
  - **GL** (CC) Noise Circles 2 (with soundtrack) [84"]
  - **GB** (AJ) Ensemble text 1 [60"]
  - **GM** (BQ) Antiphonal Chamber Music 4 [29"]
  - **GN** (BX) Antiphonal Chamber Music 3 [47"]
- **SOUND INSTALLATION: Landscape with figures**
- **GO** (BF) Tutti Fragment 7 (within sound installation) [29"]
- **GP** (BS) String signals 7 (within sound installation) [9"]
  - **GQ** (BY) Tutti Fragment 4 [1'47"]
  - **GR** (BC) Noise Circles 1 [49"]
- **SOUNDSCAPE** (soft industrial track, overlap with next)
- **GS** (CZ) String signals 3 (within soundscape) [27"]
- **SOUND INSTALLATION: Landscape with figures** (no orchestral chords or Ravel percussion)
- **GT** (CP) Tutti Fragment 8 (within sound installation) [28"]
  - **GU** (CY) Antiphonal Chamber Music 6 [57"]
  - **GV** (CG) String signals 10 [22"]
  - **GW** (CR) Antiphonal Chamber Music 5 [53"]
  - **GX** (CK) Ensemble Fragment 2 [22"]
  - **GY** (BI) Ensemble text 2 [50"]

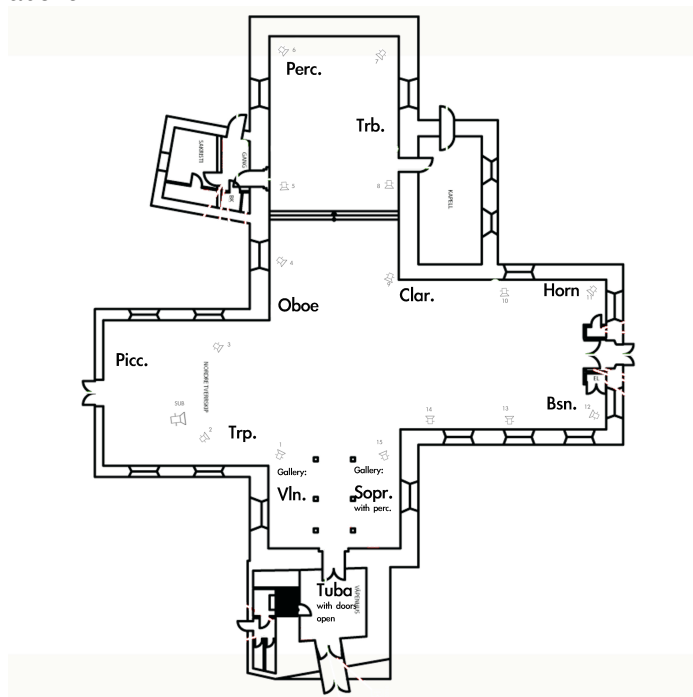
# Don't feed the birds

So far, everyday sounds as field recordings and isolated samples have been used as direct sound materials. In the main work *Landscape with figures II*, spectral analysis of tam-tam sounds were used as musical materials, while I found methods of scaling and distortion through trajectory curves, with work on tuning systems, sufficient in most cases. Translations from everyday sounds to musical materials could have been more present in the final work, even though such structural connections are more below the surface level than the actual sounds used. For this reason, I will present examples from the work *Don't feed the birds*, which was composed in parallel with the main concluding work, using methods developed as part of the project.

*Don't feed the birds* was commissioned by Sjøforsvarets Musikkorps, Bergen, and written for:

- High Soprano with percussion instruments
- Violin
- Piccolo/Flute
- Oboe
- Clarinet in Bb
- Bassoon
- Horn in F
- Trumpet in C
- Tenor Trombone
- Tuba
- Percussion
- Live electronics

Spatial distributions of the ensemble were planned for specific locations. The church Korskirken in Bergen has been explored by ensemble Lemur<sup>166</sup> through a site specific improvisation, and I initially planned the piece for this church. Some sections of the piece are composed directly from irregular circular trajectories,<sup>167</sup> following the spatial order of this heterogeneous ensemble, the same approach as used for the antiphonal fragments described above.

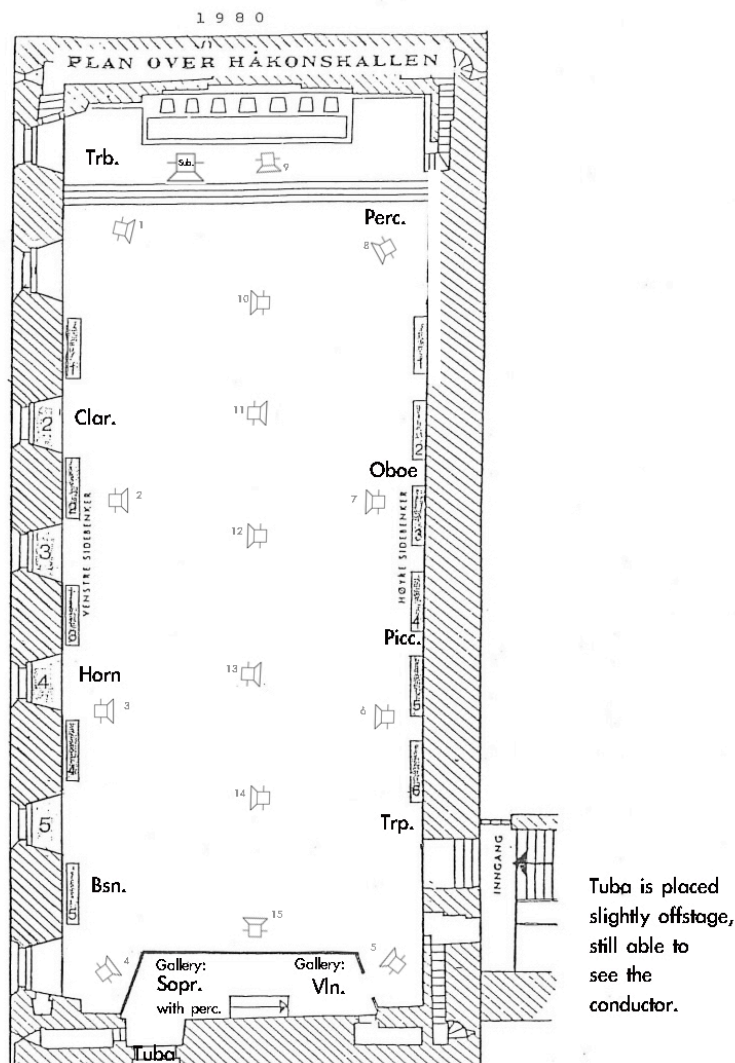


<sup>166</sup> <http://criticalband.wordpress.com/>

<sup>167</sup> Using the Ruben-OM method *ensemble-circles-lists-gliss.*

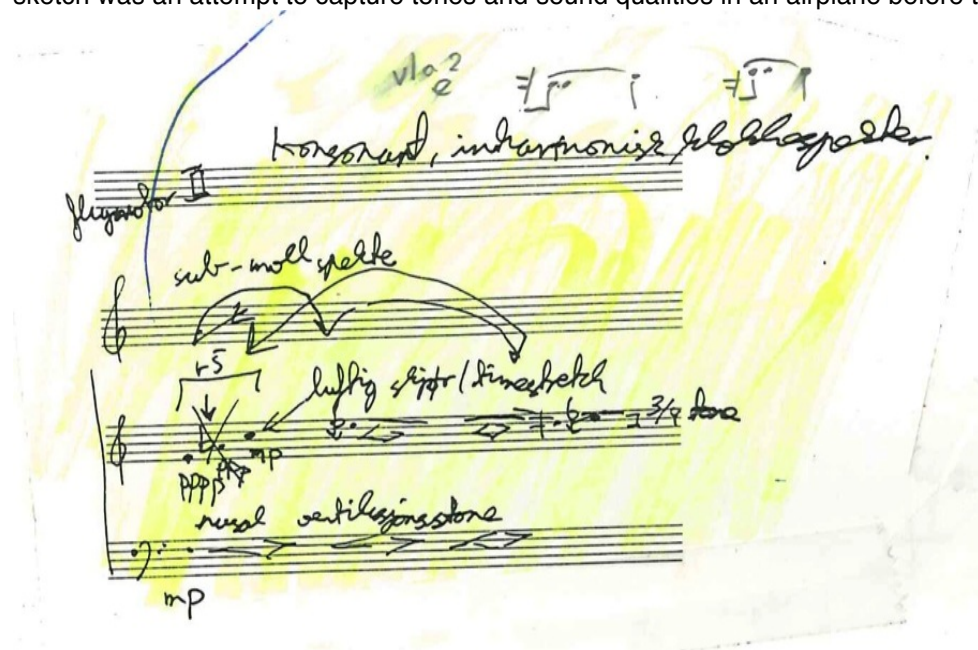
I found the piccolo position, close to the wall, one of the most resonant spots in the room. I had in mind that the piccolo could be naturally amplified by the room. Bjørnar Habbestad suggested from his experiences with the *Critical Band* project that playing against the walls, standing in an angle where sound will not be damped by your body, also would amplify the sound. The violin and soprano is placed on the organ gallery, and a muted “offstage” tuba could better balance the middle register piccolo.

I made an alternative plan for Håkonshallen, Bergen, which is a very different room. Similar ideas of spatial movement could be realized mirroring the setup. A gallery is available for the soprano and violin, while the “offstage” tuba rather would be amplified at this new position, as the stairs down from the hall are very resonant.



*Don't feed the birds* alternates between sections where instrumental spatial trajectories are prominent structuring principles, and instrumental interpretations of spectral analysis of sounds of birds being fed. The second type comes closer to a search for musical ideas drawn from concrete everyday sounds.

In past works I have been attempting to transcribe everyday sounds by ear. The following sketch was an attempt to capture tones and sound qualities in an airplane before takeoff.



CD Track 75: Airplane transcription in Circles.

- 32 -

- 112 -

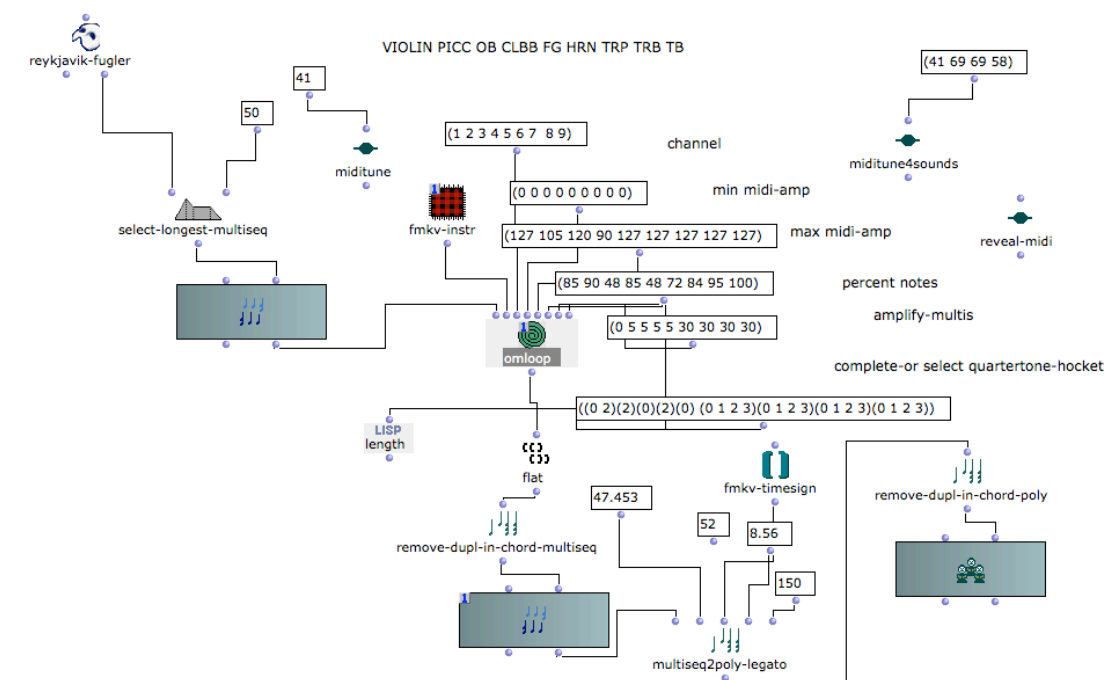
Components of everyday sounds, or purely imagined instrumental sound terrains, can be imagined and visually sketched. I tried the approach of deriving materials directly through spectral analysis for *Don't feed the birds*.

A crowd of ducks, goose and swans were being fed at the small lake Tjörnin in the centre of Reykjavik. I made recordings of these birds fighting over the food, forming a concrete basis for many parts of this piece.

CD Track 76: Recorded birds by Tjörnin, Reykjavik, 2011.

The field recordings were partial tracked through the pm2 library for Open Music.<sup>168</sup> The massive amount of information needed filtering and selection.

- Selecting only partials longer than 50 milliseconds eliminates much of the traffic noise, and allow a focus on the birds.



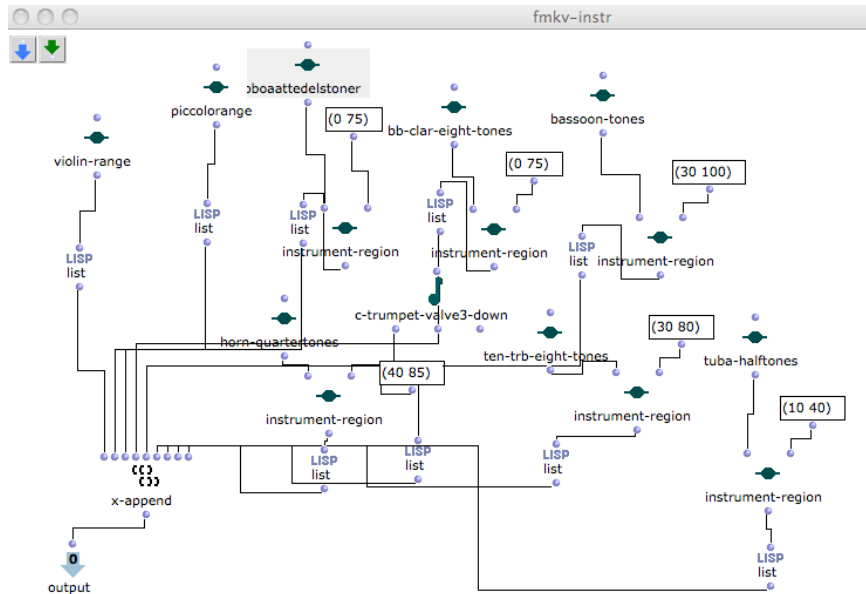
<sup>168</sup> <http://forumnet.ircam.fr/product/openmusic-libraries/>



Possible notes on the instruments are defined, and limited to particular registers.

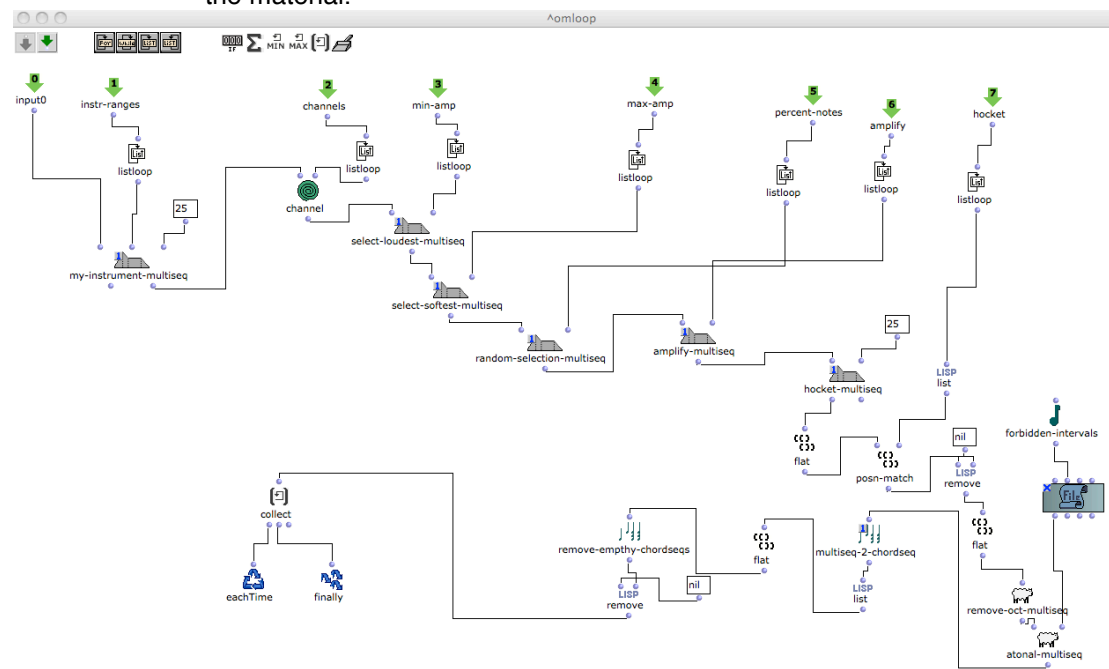
- For oboe and clarinet, only the 75% deepest notes are used.
- The 30% lowest register of the bassoon is avoided.
- For the tuba, the 10% lowest and 60% highest register, notes are excluded.

Choices are made to reduce technical difficulties of register jumps, and find homogenous ensemble sounds from these chaotic materials.



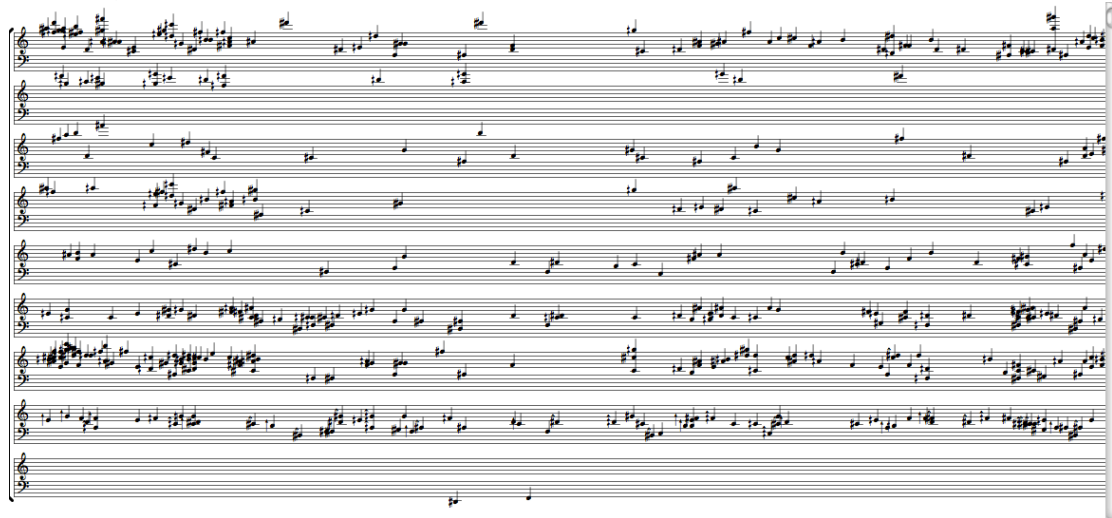
The birds go through a set of filtering processes adapted to instruments in the ensemble. The soprano voice was not part of this transcription.

- Notes less than 1/8-tone away from notes on the instrument are extracted and approximated.
- Notes are selected between a minimum and maximum dynamic limit. Not much differentiation is done here, but it would be possible to extract a dynamic range suitable for a particular instrument.
- The notes are split in 1/8-tone hockets.
  - The violin plays 1/4-tones.
  - The woodwinds play only halftones, with piccolo and clarinet tuned a 1/4-tone down. How instruments respond to detuning is complicated, and should be subject to further studies. Nevertheless, detuning will be closer to the idea than using only half-tone approximations.
  - All 1/8-tones pass to the brass instrument, but tuba is already limited to halftones, and trumpet to theoretically possible overtones with a detuned 3rd valve. Microtonal trumpet is also a complicated subject.
  - Melodic octaves and the last note of "forbidden" triads were removed from the material.<sup>169</sup>



<sup>169</sup> These are more personal preferences, and not included in the public Ruben-OM library.

The result is a heterophony of nine instrumental parts. Unisons will happen, while the parts all follow different paths through analyzed sound events, by instrumental range, random selection, filters and microtonal hockets.



CD Track 77: A MIDI performance of raw materials based on the Reykjavik birds.

Chronology and tempo was not altered (except for a shorter sections towards the end), the readings are rough scanings of everyday sounds, translated to an instrumental medium, through choice of idiomatic instrumental techniques and sounds. During the composition process, it was possible to choose between multiple paths through a dense material. Goose offer high partials to be performed by the high piccolo or string harmonics. Where a lot of partials had to be cut, sounds could be interpreted by percussion sounds with high frequency spectral energy. Bird concerts were split in shorter and longer parts, alternating with sections of purely spatial ideas. Raw materials above can be traced in the following score excerpt.

**Reykjavik birds**

- 30 -

- 31 -

In the work *Quadraturen IV* ("Selbstportrait mit Berlin"), Peter Ablinger composes out spectral analysis of traffic noises in a deliberately mechanical manner, speaking about hobbling behind the complexity of reality.

"To be precise, in terms of a very rough scanner which hobbles far behind the complexity of reality. But at the same time such hobbling reflects the truth of the observation process as well as being an aesthetic phenomenon in itself. Hobbling IS what is tangible. It IS our possibility."<sup>170</sup>

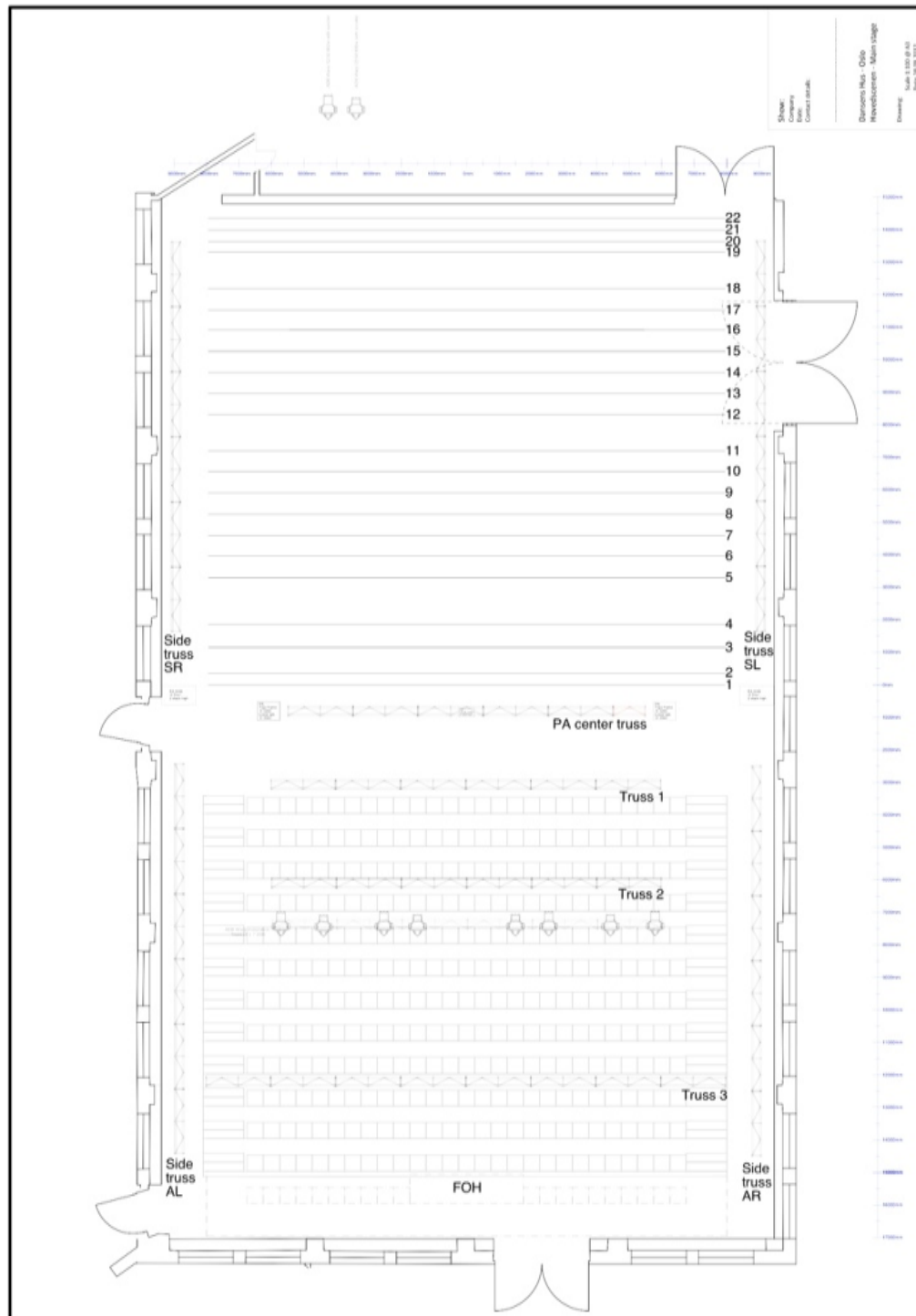
Composing *Don't feed the birds*, the intention was not to reproduce the original soundscape, but transform ('morph', if understood in a wider definition) events to gesture, like the Joyce texts were hidden and obscured spoken through instruments or electroacoustic transformations, converted to gesture and energy.

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<sup>170</sup> "Als sehr grober Raster sogar, der der Komplexität der Wirklichkeit weit hinterherhinkt. Aber dieses Hinken ist gleichzeitig die Wahrheit des Beobachtens, als auch selbst ästhetisch. Das Hinken IST das Faßbare! Es IST unsere Möglichkeit." Peter Ablinger, 2000, *Quadraturen IV* ("Selbstportrait mit Berlin").

# Production

A collaboration between Song Circus, Oslo Sinfonietta, Notam, Ultima and Dansens Hus made it possible to perform *Landscape with figures II* with the planned spatial setup, in a space without fixed seatings. The main stage of Dansens Hus, Oslo, is an amphitheatre with a large stage.



We decided to use the stage part only and close off the amphitheatre with a curtain. This was done by crew at Dansens hus.



## Sound setup<sup>171</sup>

Notam provided and rented speakers and equipment. The space was dry, and Cato Langnes placed additional microphones to add some reverb to the instruments, routed to nearest speaker in the outer circle of speakers. The voices were amplified by nearest speakers as suggested by the score. All microphones were used for a 16 track recording of the concert.

- Stine [Shure Beta 58].
- Maria [Shure Beta 58].
- Liv [Shure Beta 58].
- Anita [Shure Beta 58].
- Eva [Shure Beta 58].
  
- Violin I, bassoon and horn [DPA 4015].
- Violin II, bass clarinet [DPA 4015].
- Viola, oboe and trombone [DPA 4015].
- Cello and flute [DPA 4015].
- Contrabass and trumpet [DPA 4015].
  
- Percussion I [pair of AKG 460].
- Percussion II [pair of AKG 460].
- Harp [Neumann 140].
- Celesta [Neumann 140].
- Microtonal organ monitor [subwoofer mix directly from the organ patch].
  
- Soundfield ST350 microphone close to the conductor.

A Behringer 32X mixer allowed a flexible setup.

## Lights

Kyrre Heldal Karlsen was the light designer of the concert, his idea was to connect lights to the spatialization of sound.

16 channels of audio pass through the main electronics setup. Soundscapes are played at the 8 channel outer ambisonics circle. Sound installation fragments and live electronics are distributed through both inner and outer circle, through the DBAP algorithm.<sup>172</sup>

Coordinates with amplitudes of 8 static and 45 moving sources were sent from my computer to the light crew. Amplitudes of sounds were scaled to a useful range controlling intensities of lights.

The light crew hung one spotlight from the roof for each speaker, pointed at the individual speakers. Smoke machines were used to make rays visible.

The microtonal organ and live musicians were not monitored. This called for some improvisation.

The speed of spatial movements and sound events from the electronics did, in my opinion, make this direct connection to light less obvious.

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<sup>171</sup> Thanks to Cato Langnes for details about the setup.

<sup>172</sup> Developed by Trond Lossius.















## Rehearsals



## Performance



Stine Motland and Maria Norseth Garli, Ultima 7/9-2013. Photo: Henrik Beck



Liv Runesdatter and Anita Kaasbøll, Ultima 7/9-2013. Photo: Henrik Beck





Eva Bjerga Haugen, Ultima 7/9-2013. Photo: Henrik Beck



Karin Hellquist, Ultima 7/9-2013. Photo: Henrik Beck



Kjell Tore innervik, Ultima 7/9-2013. Photo: Henrik Beck



Ellen Sejersted Bøtke, Ultima 7/9-2013. Photo: Henrik Beck





Embrik Snerte, Ultima 7/9-2013. Photo: Henrik Beck



Embrik Snerte, Ultima 7/9-2013. Photo: Henrik Beck





Christian Eggen 7/9-2013. Photo: Henrik Beck



Christian Eggen 7/9-2013. Photo: Henrik Beck

# Conclusions

*Between instrument and everyday sound* was in no way a project to explore exhaustively. I will conclude by sketching areas to explore further in future projects.

## Fragment or continuity

Some fragment types challenged my past musical language through more continuous situations. *Landscape with figures II* became the longest work I have composed so far. Composing a large number of independent fragments worked slightly better for the sound installation than for fragments for the live musicians. Sound files could be triggered and mixed seamlessly. Separate instrumental fragments needed to be performed in sequence as separate movements, with possible loss of energy through page turns and interruptions. For future works, fragments could be incorporated to more continuous and uninterrupted scores.

Ideas of multidimensionality and activation of a large range of coexisting instrumental and concrete sounds could well have been taken to larger extremes, in continuous marathons of density and duration. This idea will be reserved for future works, there are tendencies in the work *Don't feed the birds*, composed in parallel with *Landscape with figures II*.

Richard Barrett discussed how large time scales with complex materials are different from large time scales in the music of Morton Feldman.<sup>173</sup> Feldman has increasingly interested me, by ways of keeping unpredictability and attention over long periods of time.

## Pitch, intonation and morphology

Working with intonation systems implied that pitch is an important structuring parameter in my music, even though a flux of timbral qualities between centered tone ('son tonique') and noise can happen at any time.<sup>174</sup> Intonation systems created some resonant overall sounds to be perceived as timbres rather than individual notes, found through intervals relations within overtone series.

Interesting research is available to structure sounds by a multitude of morphological qualities.<sup>175</sup> Future projects could have a stronger focus on other dimensions of morphology, given larger roles than pure inflections.

## A microtonal organ

It turned out possible to create a microtonal organ, even though I could wish more flexibility through the sampling technologies, added to flexibility of intonation, and transitions of intonation.

I did at early stages try to create a morphing and microtonal MIDI instrument. If two manuals of the software instrument have the same tuning, and are performed in parallel through the same MIDI keyboard, types of cross synthesis can be applied to the two output sounds rather than the sampling system itself.<sup>176</sup>

I found the organ sound more realistic in Huddersfield, played through a larger PA system, than through the small Genelec speakers used in Oslo. The organ sound may require a certain size of speakers. In order not to obstruct tutti rehearsals, it proved important to have sufficient time to get all MIDI and sound equipment to work in advance.

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<sup>173</sup> An interview in two parts found at: <http://composerconversations.com/>

<sup>174</sup> Schaeffer, 1966, *Traité des objets musicaux*, essai interdisciplines, p. 518.

<sup>175</sup> The CaraRT system developed at Ircam offer mapping by diverse criteria: <http://imtr.ircam.fr/imtr/CataRT>  
The Orchidée project offers computer aided orchestrations, through analysis of large libraries of sounds: <http://repmus.ircam.fr/orchidee>

<sup>176</sup> I tried this with Ircam's SuperVP objects for MaxMsp: [http://imtr.ircam.fr/imtr/Max/MSP\\_externals](http://imtr.ircam.fr/imtr/Max/MSP_externals)

### Virtual orchestras and morphings

Approaches to virtual morphing orchestras were found through Csound<sup>177</sup> and musical materials found through Open Music.<sup>178</sup> Building libraries of sound to my personal preferences, rather than generic sample libraries,<sup>179</sup> is a huge task when added to other challenges within the project. Repertoires of sounds were limited to a smaller sets than I initially had imagined. It was easier to create convincing melodic patterns from percussion sounds than from sampled long string notes.

Morphing was used in it's conventional meaning within cross synthesis of sounds, and in a wider sense transformations or distortions of own ideas or quotations. Not all sound morphings worked out as well in reality as imagined, ideas were tried and rejected.

Repertoire of sounds and potential morphing combinations can be expanded for future projects.

### Compositional methods

I had a breakthrough during these 3 years in development of compositional techniques and methods using Open Music, as extensions of my past sketches on paper. Potentials were to some extent explored through *Landscape with figures II*, and will go into expanding toolboxes for future works. I will rather seek a diversity of tools for musical ideas, than "the ideal technique".

### Soundscapes

Soundscapes and compositions of 'sound objects' found possible ways to live side by side in *Landscape with figures*, while concrete field recordings could be brought to greater degrees of abstraction, keeping precise spatial perceptions of soundfield recordings.<sup>180</sup> Everyday sounds appear within the concrete range of sounds, or towards an ensemble leaking into the outside world.

### Spatialization

A spatial setup made it possible to compose spatial trajectories within an ensemble. Spatial instrumental compositions have a history from venetian renaissance in San Marco, to Karlheinz Stockhausen<sup>181</sup> and Iannis Xenakis.<sup>182</sup> It would be interesting to explore this in larger orchestral formats, through more of the possible 'spatio-temporal relationships' suggested by Xenakis.<sup>183</sup>

A vocabulary of spatial diffusion of sound was found. Outside worlds from soundfield recordings<sup>184</sup> were projected to 8-channel setups,<sup>185</sup> while other sound were in flux within up to 16 speakers through the DBAP algorithm.<sup>186</sup>

### Collaboration

The collaboration with Song Circus brought past and ongoing interests for the vocal possibilities closer to a sounding reality than before. The possibility to create a work in this scale and thoroughly define a concert format from the beginning was a valuable experience.

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<sup>177</sup> <http://www.csounds.com/>

<sup>178</sup> <http://repmus.ircam.fr/openmusic/home>

<sup>179</sup> I used instrumental sounds from the Studio Online collection by Ircam, which feature more long notes than precise attack sounds.

<sup>180</sup> <http://www.soundfield.com/>

<sup>181</sup> Gruppen (1957) for 3 orchestral groups and other orchestral works.

<sup>182</sup> Terretektorh (1966) and Nomos Gamma (1968).

<sup>183</sup> Iannis Xenakis, 2010, music and architecture, p. 152.

<sup>184</sup> <http://www.soundfield.com/>

<sup>185</sup> <http://harpex.net/>

<sup>186</sup> <http://www.pnek.org/wp-content/uploads/2010/04/icmc2009-dbap.pdf>

# Literature

- Xenakis, Iannis. Music and Architecture, ed. Sharon Kanach, New York: Pendragon Press, 2010.
- [Multiple\_authors]. Musical Morphology, ed. Frank Cox og Wolfram Schurig Claus-Steffen Mahnkopf, Wolke Verlag, Hofheim, .
- — —. The Foundations of Contemporary Composing, ed. Claus-Steffen Mahnkopf, Wolke Verlag, Hofheim.
- — —. Polyphony & Complexity, ed. Frank Cox Claus-Steffen Mahnkopf, Wolfram Schurig, Hofheim: Wolke Verlag, 2002.
- — —, ed. Sonic Experience a Guide to Everyday Sounds. Québec: McGill Univeristy Press, 2005.
- — —. The Om Composer's Book.1, ed. Carlos Agon/ Jean Bresson/ Gérard Assayag, Paris: Editions Delatour France/ Ircam-Centre Pompidou, 2006.
- — —. The Om Composer's Book.2, ed. Jean Bresson/ Carlos Agon/ Gérard Assayag, Paris: Editions Delatour France/ Ircam-Centre Pompidou, 2008.
- [Multiple\_authors] Carin Levine, Mitropoulos-Bott. "The Techniques of Flute Playing." (2002): 144.
- — —. "The Techniques of Flute Playing li Piccolo, Alto and Bass Flute." (2004): 128.
- [Multiple\_authors] Edward C. Carterette, Roger A. Kendall. "On the Tuning and Stretched Octave of Javanese Gamelans." Leonardo Music Journal. 4 (1994): 59-68.
- [Multiple\_authors] Nils Peters, Trond Lossius, Jan Schacher, Pascal Baltazar, Charles Bascou, Timothy Place. "A Stratified Approach for Sound Spatialization." Porto, 2009. Proceedings of The 6th Sound and Music Computing Conference. <<http://www.jamoma.org/papers.html>>.
- [Multiple\_authors] Pascal Baltazar, Bjørnar Habbestad. "Unruhige Råume - Spatial Electroacoustic Composition Through Collaborative Artistic Research Process." New York, 2010. Proceedings of the International Computer Music Conference. <<http://www.jamoma.org/papers.html>>.
- [Multiple\_authors] Peter Veale, Claus Steffen Mahnkopf. The Techniques of Oboe Playing, Bärenreiter, ISMN M-006-31063-0.
- [Multiple\_authors] Ruth K. Ingelfield, Lou Anne Neill. Writing for Pedal Harp: A Standardized Manual for Composers and Harpists, The ScarecrowPress, Inc, 2006.
- [Multiple\_authors] Trond Lossius, Pascal Baltazar. "Dbap - Distance-Based Amplitude Panning." Montreal, 2009. Proceedings of the International Computer Music Conference. International Computer Music Association. <<http://www.jamoma.org/papers.html>>.
- [Multiple\_authors] Walter Gieseler, Luca Lombardi, Rolf-Dieter Weyer. Instrumentation in Der Musik Des 20. Jahrhunderts, Akustik, Instrumente, Zusammenwirken, Edition Moeck Nr 4025.
- Ablinger, Peter. Quadraturen Iv ("Selbstportrait Mit Berlin"), Kairos, 2000.
- Adorno, Theodor W. "Vers Une Musique Informelle." trans. Rodney Livingstone 1992. Quasi Una Fantasia Essays on Modern Music. New York: Verso, 2002. 269-322.
- Ammons, A. R. Collected Poems 1951-1971, New York: W. W. Norton & Company, 2001.
- Artaud, Pierre-Yves. Flûtes Au Présent, Gérard-Billaudot Éditeur.
- Schaatun, Asbjørn. "The Computer as a Psychoanalyst, Thoughts on Computer-Aided Composition." 1989. <<http://www.schaathun.org/no/01artikler>>.
- Barrett, Richard. "Ståsted Og Provisoriske Perspektiver." Parergon 4, s. 58. c/o NyMusikk, tollbugt. 28, 0157 Oslo.
- Bok, Henri. New Techniques for the Bass Clarinet, out of print, ordered from the author.
- Boulez, Pierre. Orientations, trans. Martin Cooper.ed. Jean-Jaques Nattiez, Faber and Faber Ltd, Harvard University Press, 1986.
- Cage, John. Silence, Lectures and Writings By John Cage, Middletown: Wesleyan University Press, 1973.
- Calvino, Italo. Six Memos for the Next Millennium, Cambridge, Massachusetts: FIRST VINTAGE INTERNATIONAL EDITION (first edition: Harvard University Press), 1993.
- — —. Amerikanske Forelesninger, trans. Roy Eriksen (norw.). Cappelen's Upopulære Skrifter, Halden/Gjøvik: Cappelen, 1992.
- — —. "Nøyaktighet." trans. Roy Eriksen (norw.). Amerikanske Forelesninger. Cappelen's Upopulære Skrifter. Halden/Gjøvik: Cappelen, 1992. 66-89.
- Electronics in New Music, New Music and Aesthetics in the 21st Century, ed. Claus-Steffen Mahnkopf/ Frank Cox/ Wolfram Schurig, vol. 4 Hofheim: Wolke Verlag, 2006.
- Deleuze, Gilles. Logique De La Sensation, Paris: Éditions du Seuil, 1981.
- — —. "Peindre Les Forces." Logique De La Sensation. Paris: Éditions du Seuil, 1981. 57-63.
- — —. Francis Bacon - the Logic of Sensation, trans. Daniel W. Smith (eng.). Minneapolis: University of Minnesota Press, 2003.
- — —. "Painting Forces." trans. Daniel W. Smith (eng.). Francis Bacon - the Logic of Sensation. Minneapolis: University of Minnesota Press, 2003. 48-54.
- Deleuze, Gilles, Guattari, Felix. A Thousand Plateaus, trans. Brian Massumi. Minneapolis: University of Minnesota Press, 1987.
- Dench, Chris. "Polyphony and Complexity." Polyphony & Complexity. Ed. Frank Cox Claus-Steffen Mahnkopf, Wolfram Schurig. Hofheim: Wolke Verlag, 2002. 180-87.
- Kahn, Douglas. Noise Water Meat, USA: The MIT Press, 2001.
- Ferneyhough, Brian. Collected Writings, Contemporary Music Studies, ed. Richard Toop James Boros, vol. 10 harwood academic publishers, 1995.
- Gallois, Pascal. The Techniques of Bassoon Playing, Kassel: Bärenreiter-Verlag Karl Vötterle GmbH & Co Kg, 2009.
- Gjertsen, Ruben Sverre. Metaforer, Metoder Og Materiale I Brian Ferneyhoughs Terrain. Noen Betraktninger Rundt Komposisjonsmåter, Bergen: Hovedoppgave fra Griegakademiet, 2006.

Grisey, Gérard. "Strukturering Av Klangfarge I Instrumentalmusikken, Henrik Hellstenius (Trans.)." Parergon 1/1997, c/o NyMusikk, tollbugt. 28, 0157 Oslo.

— — —. "Tempus Ex Machina: En Komponists Refleksjoner Omkring Musikalsk Tid (Tempus Ex Machina (1980/85) - Réflexions D'un Compositeur Sur Le Temps Musical)." (1991):

Guldbrandsen, Erling E. Tradisjon Og Tradisjonsbrudd, En Studie I Pierre Boulez: Pli Selon Pli- Portrait De Mallarmé, Acta Humaniora, vol. 23 Oslo: Universitetsforlaget AS, 1997.

Borgdorff, Henk. Sensuous Knowledge, Bergen: KHIB.

Kaufmann, Henry W. "More on the Tuning of the "Archicembalo"." Journal of the American Musicological Society. 23, No. 1 (1970): 84-94.

Hill, Douglas. Extended Techniques for the Horn, Warner Bros. Publications,.

Barbour, J. Murray. "Irregular Systems of Temperament." Journal of the American Musicological Society. 1, No. 3 (1948): 20-26.

Joyce, James. Finnegans Wake, England: Penguin Books, 1992.

Rahn, Jay. "Javanese Pélog Tunings Reconsidered." (1978): 69-82.

Kramer, Jonathan D. The Time of Music, New York: Schirmer books, 1988.

Kruse, Bjørn. Den Tenkende Kunstner, Oslo: Universitetsforlaget, 1995.

Kuttner, Fritz A. "The 749-Temperament of Huai Nan Tzu (+ 123 B. C.)." Asian Music. 6, No. 1/2 (1975): 88-112.

Lachenmann, Helmut. "Om Å Komponere." Parergon 4, s.10, c/o NyMusikk, tollbugt. 28, 0157 Oslo.

— — —. "Klangtypen Der Neuen Musik." Musik Als Existentielle Erfahrung. Wiesbaden: Breitkopf & Härtel, 2004. 1-20.

— — —. Musik Als Existentielle Erfahrung, Wiesbaden: Breitkopf & Härtel, 2004.

Ladefoged, Peter. Vowels and Consonants, Los Angeles: Blackwell Publishing, 2003.

Londeix, Jean-Marie. Hello! Mr. Sax Or Parameters of the Saxophone, Editions Musicales Alphonse Leduc, 175, rue Saint Honoré, 75040 Paris cedex 01, A.L. 27.489.

Mâche, François-Bernard. Portait(S) De Iannis Xenakis, Rennes: Bibliothèque national de France, 2001.

Mahnkopf, Claus-Steffen. "Vers Une Musique Figurelle ?" Contrachamps. 8 (1988): 45-63.

— — —. "Complex Music: An Attempt At a Definition." Polyphony & Complexity. Ed. Claus-Steffen Mahnkopf/ Frank Cox/ Wolfram Schurig. Hofheim: Wolke Verlag, 2002. 54-64.

— — —. "Kunstimmanente Remedur, Das Manierismusproblem." Musiktexte. 49 (1993): 23-26.

Harley, Maria Anna. "Space and Spatialization in Contemporary Music: History and Analysis, Ideas and Implementations." Quebec, 1994. McGill University, School of Music.

Chion, Michel. Guide Des Objets Sonores: Pierre Schaeffer Et La Recherche Musicale, Buchet/ Chastel/ INA-Grm, 1983.

— — —. "Guide to Sound Objects: Pierre Schaeffer and Musical Research." Paris, 2010. Editions Buchet/Chastel.

John Dack/Christine North <<http://www.ears.dmu.ac.uk/IMG/pdf/Chion-guide/>>.

Partch, Harry. Genesis of a Music, Da Capo Press, 1974.

Radulescu, Horatiu. "Brain and Sound Resonance." Annals of the New York Academy of Sciences. <http://www.annalsnyas.org/>.

Rehfeldt, Phillip. New Directions for Clarinet, Scarecrow Press, Inc, 1994.

Toop, Richard. "Four Facets of 'the New Complexity'." Contact nr.32. (1988):

Roth, Michel. "Das Einzelne Und Das Ganze: Zum Programm Von Moderne 7." Lucerne Festival, sommer 2006, Sprache, konserterprogram for 13/9.

Contemporary Compositional Techniques and Openmusic, ed. Bob Gilmore Rozalie Hirs, Paris: Editions Delatout/Ircam-Centre Pompidou, 2009.

Gjertsen, Ruben Sverre. "Between Instrument and Everyday Sound." Bergen, 2011. Project description for Norwegian Artistic Research Programme. <<http://www.bek.no/~ruben/research.html>>.

— — —. "3 Manual Microtonal Organ." Bergen, 2013. <<http://www.bek.no/~ruben/research.html>>.

— — —. "The Ruben-Om Patch Library." Bergen, 2013. <<http://www.bek.no/~ruben/research.html>>.

Ruth K. Inglefield, Lou Anne Neill. Writing for the Pedal Harp, Vanderbilt Music Company, 1985.

Saunders, James. "Developing a Modular Approach to Music." Huddersfield, 2003. University of Huddersfield. <<http://eprints.hud.ac.uk/5942/>>.

Schaeffer, Pierre. Solfège De L'objet Sonore, Ina-GRM, 275 602, ADD 785, 1998.

— — —. Traité Des Objets Musicaux, Essai Interdisciplines, 27, rue Jacob, Paris VIe: Éditions du Seuil, 1966.

Schafer, R. Murray. The Soundscape, the Tuning of the World, Vermont: Destiny Books, 1994.

Sciarrino, Salvatore. Le Figure Della Musica Da Beethoven a Oggi, Milano: Ricordi, 1998.

Smalley, Denis. "Spektromorfologi Og Strukturerende Prosesser." Parergon 3, s.44, c/o NyMusikk, tollbugt. 28, 0157 Oslo.

Smithson, Robert. The Collected Writings, ed. Jack Flam, University of California Press, 1979.

**Software. "For Sound and Computer Assited Composition:** Ircam Forum: Open Music, Audiosculpt, Spat, Diphone and." <Modalys, with manuals. Also containing libraries for Open Music and for Max/msp, with documentation. Downloads for members: <http://forumnet.ircam.fr/> MaxMsp, with manuals: <http://www.cycling74.com/> Soundhack; <http://soundhack.com/> Csound with manuals and utilities: <http://csounds.com/> Finale; <http://finalemusic.com/> Ambisonics for MaxMsp and relevant articles for download; <http://www.icst.net/> Jamoma for MaxMsp <http://jamoma.org/> Melodyne <http://www.celemony.com/cms/> Reaper <http://www.reaper.fm/> Harpex <http://harpex.net/> Wave Editor <http://www.audiofile-engineering.com/> Soundfield plug-ins <http://www.soundfield.com/>>.

Spahlinger, Mathias. "Alles Aus Allem Entwickeln [Conversation With Reinhard Oehlschlägel]." MusikTexte 39. 23-32.

Toop, Richard. Concerto. Que Me Veuz-Tu? Booklet Text for Les Froissements D'ailes De Gabriel By Brian Ferneyhough, 2010: KAIROS CD.

Turetzky, Bertram. The Contemporary Contrabass, Los Angeles: University of California Press, 1989.

Vitale, Wayne. "Balinese Kebyar Breaks the Five-Tone Barrier: New Composition for Seven-Tone Gamelan." Perspective of New Music. 40, No. 1 (2002): 5-69.

Wishart, Trevor. On Sonic Art, Harwood Academic Publishers, 1996.

Xenakis, Iannis. Formalized Music [Translated From French Edition (1955-65)], Hillsdale, NY: Pendragon Press, 1992.